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'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

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Technical Instruction in Elementary Schools.

BY SIR PHILIP MAGNUS.

IV.—MANUAL TRAINING—WOODWORK.

THE advantages of a further development of manual training than is possible through the teaching of drawing and modelling have been much canvassed of late years, but the prevailing opinion is decidedly favorable to the introduction of some kind of hand work in schools, by which boys may learn the use of ordinary tools, and may acquire some skill in the construction, in some easily workable material, of simple objects from properly executed drawings. It is to the French that we mainly owe the encouragement which has lately been given to the teaching of wood-work in schools. Although the system adopted in the well-known Communal School in the Rue Tournefort* has not been generally adopted in France, nor in other countries, the efforts of M. Salicis, the founder of the school, seconded by M. Laubier, the present head master, have been successful in directing attention to the importance, both from an educational and economical standpoint, of handicraft instruction; and already, in the year 1886, out of 174 primary schools, supported by the City of Paris, 95 were provided with workshops: 90 for instruction in carpentry and wood-turning, and 5 for metal work.

In these schools, the manual teaching has, hitherto, been given either before or after the ordinary school hours, but the Municipal Council of Paris attach such importance to this training that it is proposed to make the workshop instruction a part of the regular school curriculum. In the higher elementary schools of France the training is carried to a much more advanced stage. Belgium has followed France in recognizing the advantages of workshop training, and in the United States a public opinion in favor of manual training is being rapidly formed, which promises to exert an important influence upon the educational and industrial progress of the American people.†

It cannot be too often repeated that the object of workshop practice, as a part of general education, is not to teach a boy a trade, but to develop his faculties and to give him manual skill; that although the carpenter's tools may be employed as instruments of such training, its purpose is not to create carpenters. The absence of any good word to express all that is implied by manual instruction, as given by a competent teacher, is one of the causes of the lingering belief that the object of the instruction is to make tradesmen, who, it is justly said, can be much better trained in the shop. To dispel this illusion it is necessary to explain what are the objects and advantages of the instruction, and by what means they can best be realised. It would be some gain if the Swedish word 'Slöjd' could be employed to indicate the system of instruction. But, unfortunately, 'Slöjd,' which is a very good term, supposed to be connected with the English word 'sleight,' as used in the phrase 'sleight of hand,' implies a particular system of manual training which is, no doubt, well enough adapted to the industrial conditions of Sweden, but which differs in many respects from the system which, with such experience as we have already gained, can be recommended for adoption in this country. The term 'Slöjd,' however, might be accepted as a general name for workshop instruction, the object of which is not the teaching of any particular trade, whilst the method of the instruction might vary in different countries, or even in different parts of the same country, according to the views of the teacher or the wants of the pupils.

As a discipline supplementary to that of drawing and modelling, workshop instruction, by whatever name it may be called, is valuable as teaching a knowledge of *substance* in addition to that of *form*. Moreover, under competent instructors, it may be made an instrument of education similar in many respects to practical science. In the workshop, the operations

* For a full description of the work of this school, see 'Le Travail Manuel,' by D. Laubier & A. Bougerret, Paris, 1887.

† See the Monographs and other publications which are being now periodically issued by the 'Industrial Education Association,' New York (9, University Place), U.S.

to be performed are less delicate, the instruments are more easily understood, the substances employed are more ordinary; but the training is very similar, and in so far as the faculties exercised are those of observation rather than of inference, the training, educationally considered, is a fitting introduction to laboratory practice. At the same time the skill required in the workshop is particularly useful to the laboratory student in enabling him to make and fit apparatus and in giving him that adroitness on which progress in scientific work so much depends. Whilst manual training is valuable in the education of all persons—a fact which is already recognised by the headmasters of several of our secondary schools—the usefulness of this kind of training is much greater in the case of the children of the working classes, whose education is too limited and often too hurried to admit of any practical science teaching, such as older children obtain, and to whom the skill acquired is of real advantage in inducing in them an aptitude and taste for handicrafts, in facilitating the acquisition of a trade, and possibly in shortening the period of apprenticeship or of that preliminary training which in so many occupations takes the place of it.

An objection is sometimes raised to the introduction of manual training into elementary schools on the ground that as the children of the working classes necessarily leave school at an early age, and spend their lives for the most part in manual work, such time as they can give to study should be occupied in other pursuits—in cultivating a taste for reading and in the acquisition of book knowledge. This objection is due to a misconception of the true objects and aims of education, and to an imperfect knowledge of what is meant by workshop instruction. To assume that the best education can be given through the medium of books only, and cannot be equally well obtained from the study of things, is a survival of the Mediævalism against which nearly all modern educational authorities protest. But there is another and more deeply-rooted error in this argument. People often talk and write as if school time should be utilised for teaching those things which a child is not likely to care to learn in after life; whereas the real aim of school education should be to create a desire to continue in after life the pursuit of the knowledge and the skill acquired in school. In other words, the school should be made, as far as possible, a preparation for the whole work of life, and should naturally lead up to it. The endeavour of all educators should be to establish such a relation between school instruction and the occupations of life as to prevent any break of continuity in passing from one to the other. The methods by which we gain information and experience in the busy world should be identical with those adopted in schools.

But in order that the teaching may not degenerate into mere craft lessons, the methods of instruction must be carefully considered. That the training of the hand and eye, and the development of the mental faculties are the objects to be aimed at, should never be lost sight of. In many respects, the instruction should partake of the character of ordinary object lessons. Before the pupil commences to apply his tools to the material in hand, he should learn something of its nature and properties. The teacher should briefly explain the distinguishing characters of the different kinds of wood, as met with in the shop, and as found in nature, and also the differences in the structure and properties of wood, according to its treatment, etc. He should further illustrate his lessons by reference to specimens and examples, a collection of which should be found in every school workshop.

Something should be said of the countries from which timber is imported, and the conditions under which it is bought and sold; and in this way, the material to be manipulated should be made the centre of a series of scientific object-lessons. Concurrently with the practice in the use of any tool, the pupil should learn its construction, and the reason of its shape. The foot-rule, the saw, the plane, and the chisel, might each be made the subject of an object lesson to the pupils. In the same way, the teacher should explain the purposes of the different parts of constructive work, and should have models of tenon, mortice, dove-tailing, and other joints to illustrate his explanations. Fifteen or twenty minutes thus spent might be made the means of stimulating, and of exercising, the observing and reasoning faculties of the children, and of enabling them to fully understand the work they are doing and the instruments they are using.

Further, the children should be taught as soon as possible to work from correct scale drawings from their own rough sketches. However simple the object may be which the pupil is to construct, it should exactly correspond with his own drawings. In this way the workshop instruction supplements, and gives a meaning to, the drawing lesson, and the school teaching is made to have a direct bearing upon the subsequent work of the artisan. Dr. Woodward, the instructor of the St. Louis Manual Training School, who has had considerable experience in organising and superintending workshop instruction, tells us:—'The habit of working from drawings and to nice measurements gives to students confidence in themselves altogether new;' and he justly claims, 'That it is the birthright of every child to be taught the three methods of expression:— 1st, by the written, printed, or spoken word; 2nd, by the pencil and brush, using the various kinds of graphic art; 3rd, through the instrumentality of tools and materials which enable one to express thought in the concrete.'

Great use should be made of the black board in these lessons, and the pupil should be practiced in copying on paper, from drawings produced on the black board by the teacher, plans and sections of different kinds of joints, and of simple objects. The principle underlying such lessons is the combination of descriptive object lessons with geometry, drawing, and constructive work.

Both as regards the descriptive and practical instruction, a careful scheme of lessons should be prepared by the teacher, so that the pupils may be taken, step by step, from simpler to more important work.

The experiment of introducing work-shop instruction into public elementary schools is now being tried under very favourable conditions by the School Board for London, the funds having been supplied by the Drapers' Company, and the scheme of instruction

elaborated by a joint committee of the School Board and the City and Guilds of London Institute. The syllabus approved by the committee is as follows:—

I.	II.	III.	IV.	V.
WOODS COMMONLY USED—	TOOLS—	PRACTICAL WORK (A).	PRACTICAL WORK (B).	PRACTICAL WORK (C).
(*a*) Conditions of Growth.	1. *Boys' Set.*	Measuring and Sawing to line.	(*a*) Construction of Simple Joints according to Model and Drawing.	(*a*) Glueing.
(*b*) Felling and Seasoning of Timber.	(*a*) Description.	Squaring piece of wood.	(*b*) Construction of Simple Objects founded on Simple Joints.	(*b*) Hinging.
(*c*) Properties of Woods.	(*b*) Manipulation.	Nailing and Screwing.		(*c*) Knots—Tying, &c.
(*d*) Heartwood, Sapwood, &c.	(*c*) Sharpening.	*Construction of Simple Joints*		
	2. *'Centre' Set.*	(*a*) Exhibition of Model of Joint.		
	(*a*, *b*, *c*) As above, less of detail.	(*b*) Explanation of Drawing of Joint.		
	3. *Nails.*	(*c*) Connection between Model and Drawing.		
	(*a*) Kinds.			
	(*b*) Uses.			
Museum of prepared specimens of woods to be formed in each centre.	4. *2 ft. Rule.* To be specially treated.			

This scheme has not been sufficiently long in operation to enable any judgment to be passed on the results. But it would seem that it is on such lines as these that workshop instruction must be given, if it is to form a part of the ordinary curriculum of our elementary schools.

In organising a scheme of technical teaching in connection with our elementary schools, the difficulty has to be met of obtaining good teachers and competent inspectors. The artisan who is a skilful workman and nothing more may succeed in teaching the elements of carpentry and joinery; but he is not the kind of teacher needed. It is of the utmost importance that the teacher should be a good draughtsman, should have some knowledge of physical science, should be a fairly expert workman, and should have studied the art of teaching. To obtain at first such ideal instructors would be impossible; but there is no reason why gradually they should not be trained. Two processes suggest themselves. We might take a well-trained elementary teacher, having an aptitude for mechanical arts, and give him a course of instruction in the use of tools, either in a technical school or in an ordinary workshop. Or, we might take an intelligent artisan, who had studied science and drawing in some of the excellent evening classes which are now found in almost every town, and give him a short course of lessons on method in relation to workshop instruction. Good teachers might be obtained by either of these processes. But the former is certainly preferable for the simple reason that the instruction should be regarded as a part of the general education of the boy, not as a part of his apprenticeship. The trained teacher who has received a course of workshop instruction will undoubtedly be better able to make his lessons yield educational discipline than the tradesman who has had no pedagogic experience. On the other hand, the expert carpenter would be preferable if the object of the instruction were to teach the boy a trade. The great difference between the two instructors is—that the one has a deeper insight into the nature of the children, and the other a more thorough acquaintance with the practical details of the work in which they are engaged. Of course, a knowledge of the materials employed and sufficient manipulative skill are absolutely essential for the teacher of wood-work; but no less essential to the teacher of young children is a knowledge of the methods of instruction, founded on some acquaintance with the psychology of child-life.

At the Central Institution of the City Guilds, classes have been formed for the instruction of school teachers under the direction of the professor of engineering assisted by competent artisans; and in these classes the teachers have had the opportunity of acquiring, not only the manual skill necessary to enable them to command the respect of their pupils, but also a knowledge of the best methods of instruction, which those who have been previously trained are able, with great advantage, to apply in their practical lessons. If workshop instruction is to take a place in elementary education, it is desirable that the teachers should be trained school-masters. The ordinary mechanic, who will be found to be most serviceable as an assistant to the teacher, is generally unaccustomed to deal with very young children, is unacquainted with the graduated methods by which all sound instruction is imparted; and is too apt to treat his pupils like apprentices, who learn their trade by being shown 'how to do it' without understanding the reason why. It is an essential part of the Swedish system of 'Slöjd' teaching to place the workshop instruction under the direction of a trained schoolmaster. In other respects, particularly in neglecting to train the pupils to work at a very early stage in their progress from dimensioned drawings; in looking to the usefulness of the object to be made as an essential factor in the choice of exercises; and in strictly limiting the number of tools to be used by the child, the Swedish system should not, I think, be too closely followed, as not being sufficiently well adapted to the future wants of the children of this country.

In recommending the introduction of workshop instruction into elementary schools, it is necessary to note the probable cost of the tools and fittings. The cost is not so great as is sometimes supposed. An ordinary schoolroom, about 26 feet by 22 feet, will take five carpenter's benches, each about 14 feet long, by 2 feet 6 inches in width, and provided with six vices, affording places for 30 boys, the maximum number to be taught in one class. The benches should be well made, and fitted with every appliance for facilitating the pupil's progress, the object of the instruction being strictly educational, and the benches and tools being regarded as apparatus for instruction. The cost of the five benches would be about £25.

The room should contain a cabinet for holding tools for general purposes, and specimens of wood. Where several classes receive instruction in the same room, a set of tools should be appropriated to each group of boys who in turn occupy the same bench. This set of tools may be provided at the cost of 15s. Besides these tools, some few larger and more expensive tools are required for general use, the cost of which, for each centre, should not exceed £12.

In arranging the scheme of instruction, it will suffice to give each class of thirty boys one lesson a week, of two hours and a half or three hours' duration. The lessons, as previously explained, should consist partly of oral teaching on the growth and nature of woods and the use of tools, partly of drawing, and partly of practical work at the bench.

The shop thus fitted may be used in succession by different sets of boys, from neighbouring schools; but it is preferable that the class, in each case, should receive instruction from its own school-teacher. To employ one teacher continuously to instruct different sets of boys would prove, after a time, tiresome to the teacher, and the teacher himself would gradually lose that sympathy with his pupils' studies in other subjects, which it is essential to maintain, if workshop instruction is to become a part of the general education of the school children. On the other hand, it is an advantage that the artisan assistant should be permanently attached to the school workshop. With such arrangements the cost of the teaching appliances would fall lightly upon each school; for supposing the workshop to be used on only three whole and two half days in the week,* it would serve for eight sets, that is, for 240 pupils. The cost of the material would, of course, increase with the number of pupils; but as the work would consist more of exercises illustrating principles than of the construction of useful objects, the quantity of material consumed would not be large, and the cost of it should certainly not exceed 10s. a month for each class of 30 boys. Differences of opinion exist as to the age at which workshop instruction should commence; but if the teaching of drawing be continued throughout the standards, and be followed or accompanied by lessons in modelling, so that there be no break in the manual training of the child from the time he leaves the Kindergarten, I am inclined to think that, as a general rule, boys should have passed the fifth standard before commencing to use wood working tools.

Whilst advocating the general introduction of workshop teaching into elementary schools, I cannot lose sight of the fact that such instruction is likely to prove more serviceable to children of urban than of rural schools. In the latter it may be advantageous to partly substitute for the teaching of wood-work, some practical instruction in agriculture. But although a relation must always be maintained between the subjects of school teaching and the activities of life, necessitating elasticity and variety in any code of instruction, I cannot but think that practice in the use of wood-working tools is almost, if not quite, as serviceable to the children of an agricultural as of a town population. Indeed wood-work is selected as the subject of manual training because the exercise is in itself educational, and because some skill in the use of the tools employed is needed in nearly every trade and occupation. In a recent report of the Committee of Council on Education it is stated:—'After the three elementary subjects and sewing, no subject is of such importance for the class of girls who attend public elementary schools; and lessons in it, if properly given, will be found to be not only of practical use, but to have the effect of awakening the interest and intelligence of the children.' Surely what is true of sewing and cooking in the case of girls, is true to a greater extent of drawing and handicraft in the case of boys. The argument for teaching needlework to girls applies with almost equal force to the teaching of handicraft to boys. The object of teaching girls to sew is not to train professional dressmakers and milliners, but to make girls useful and *tidy* in their homes; and apart from the educational value of workshop instruction, one great advantage of it is that it makes boys generally *handy*. It does not make them carpenters or cabinet-makers, but it enables them to learn any trade more easily. The tools used in carpentry are wanted in many trades, and the boy who has acquired facility in the use of the plane, the saw, and the chisel will find it much easier to learn the use of any special tool he may subsequently need in the practice of his trade. But no small part of the value of workshop instruction is the skilfulness acquired which enables a man to make his home more commodious, to fit a shelf or cupboard, to repair a broken piece of furniture, or possibly to decorate his room. The comfort and cheerfulness of a poor man's home depend almost as much upon the husband's *handiness* as upon the wife's *neatness*.

Nor must we overlook the moral influence of this kind of training. Dr. Woodward, from whom I have above quoted, rightly says, 'It stimulates a love for intellectual honesty.' It teaches a boy to find out things for himself, to substitute personal experience for the statements of others: it creates moreover habits of industry and order. It forms a pleasing alternation to purely literary work, and enables a child to be constantly actually employed. It further teaches self-respect and a respect for the honest work of others. 'A boy who sees nothing in manual labour but mere brute force despises both the labour and the labourer.' 'With the acquision of skill in himself comes a pride in the possession and the ability and willingness to recognize it in his fellows.'

It is often said that all boys have not an aptitude for manual work. This is doubtless true, 'but it is equally true that every child has not an aptitude for spelling or reckoning. Nevertheless the three R's are taught to all children indifferently, and when we come to realise the importance of cultivating in children some amount of manual skill, workshop instruction will doubtless, also, find a place among the subjects of primary instruction.

Nearly all educationists have pointed out the many advantages of enabling children at an early age to realise the connection between *knowing* and *doing*. Comenius has well said: 'Let those things that have to be done be learnt by doing them.' Rousseau has pithily expressed a similar idea in saying, '*Souvenez-vous*

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qu'en toute chose vos leçons doivent être plus en actions qu'en discours ; car les enfants oublient aisément ce qu'ils ont dit et ce qu'on leur a dit, mais non pas ce qu'ils ont fait et ce qu'on leur a fait.' Locke, speaking of the education of a gentleman—for in his day the education of the poorer classes was scarcely thought of—says: 'I would have him learn a trade, a manual trade;' and Emerson, in the choice words, 'Manual labour is the study of the external world,' tersely states the whole aim and purpose of my remarks. 'The introduction of manual work into our schools is important,' says Sir John Lubbock, 'not merely from the advantage which would result to health, not merely from the training of the hand as an instrument, but also from its effect on the mind itself.' Rabelais, Montaigne, Pestalozzi, Fröbel, Combe, Spencer, and others have urged the importance of practical teaching, of studying things before words, of proceeding from the concrete to the abstract. A very valuable and interesting report has recently been issued by a committee of the School Board for London, of which Mr. Bousfield was chairman, in which it is recommended 'that special manual instruction should be given under the following principles: (1) That manual work be always taken in connection with school teaching of underlying sciences and drawing; (2) That no special trade be taught.' The Report further states: 'Woodwork supplies the most convenient mode of giving manual instruction to elder boys. The material is cheap and easy of manipulation, and can be made illustrative of the intellectual work of the school.'

In what I have said I have endeavoured to show that workshop instruction may and should be made a part of elementary instruction; that, as an educational discipline, it serves to train the faculties of observation, to exercise the hand and eye in the estimation of form and size and the physical properties of common things; that the skill acquired is useful in every occupation of life, and is especially serviceable to those who are likely to become artisans, by inducing taste and aptitude for manual work, by tending to shorten the period of apprenticeship, by enabling the learner to apply to the practice of his trade the correct methods of inquiry which he has learnt at school, and by affording the necessary basis for higher technical education.

In this country we frequently complain that children leave school at too young an age, before they have had time to properly assimilate the knowledge they have acquired, with the result that they soon forget a great part of the little they have learnt. At the age of fifteen or sixteen, when they begin to feel the want of technical instruction, they are wholly unprepared to avail themselves of the opportunities for obtaining it now brought within their reach. A large part of what the nation spends on education is thus practically wasted. It is to remedy this state of things that continuation schools and recreative classes are much needed. But there can be little doubt, if elementary education were made more practical, that parents would be more willing, even at some sacrifice, to let their children benefit by it. They are often led to take their children away from school because they do not see much use in the 'schooling.' Of course the desire to secure the child's early earnings operates in very many cases; but I am convinced that it would be easier to persuade parents to forego these earnings if the school teaching had more direct reference to the work in which the children are likely to be subsequently engaged.

I have already shown that workshop instruction is of great value as an introduction and a help to the study of practical science. Of the importance of science teaching in elementary school instruction I shall speak in the next article.

(*To be continued.*)

Model Answers to Certificate Questions, Christmas, 1887.

Male and Female Candidates.

FIRST YEAR.

German.

Male Candidates may answer questions in *two* Languages; *Female* Candidates in *one* only.

TWO *hours allowed for this Paper for Male Candidates;* THREE *hours for Female Candidates.*

N.B.—German words must be written in English characters.

SECTION I.

Translate into English:—

(*a*) Das Feuer loderte nun recht luſtig im Walde, der Morgen war friſch, wir ſetzten uns alle rings umher auf den Raſen und zwei von den Muſikanten nahmen ein Töpfchen, worin Kaffee und auch ſchon Milch war, vom Feuer, holten Brod aus ihren Manteltaſchen hervor, und tranken abwechſelnd aus dem Topfe, und es ſchmeckte ihnen ſo gut, daß es ordentlich eine Luſt war anzuſehen. Der Waldhorniſt aber ſagte: „Ich kann das ſchwarze Geſöff nicht vertragen," und reichte mir dabei die eine Hälfte von einer großen, übereinander gelegten Butterſchnitte, dann brachte er eine Flaſche Wein zum Vorſchein. „Will der Herr nicht auch einen Schluck?" Ich that einen tüchtigen Zug, mußte aber ſchnell wieder abſetzen und das ganze Geſicht verziehen, denn es ſchmeckte wie Drei-Männer Wein. „Hieſiges Gewächs," ſagte der Waldhorniſt, „aber der Herr hat ſich in Italien den deutſchen Geſchmack verdorben."

(*b*) Athemloſer hatte nie eine Gemeinde ihrem Seelenhirten gelauſcht und inbrünſtiger niemals im ſtillen Gebet ſich geſammelt, als da jetzt der ehrwürdige alte Mann ſeine dürren Hände erhob und über die Ausziehenden und Zurückbleibenden den Segen ſprach. Auch war keine heilige Handlung jemals andächtiger begangen worden, als die, deren Schauplatz nun, nachdem Geſang und Orgel verſtummt waren, das Gotteshaus wurde.

(*c*) Parse fully:—nahmen, abwechſelnd, gelegten, verdorben, andächtiger.

(*a*) The fire blazed cheerfully in the forest, the morning was fresh, and we all sat down round about on the turf. Two of the musicians took a little pot, in which were milk and coffee, from the fire, and produced some bread out of their cloak-pockets. They drank one after another out of the pot and they enjoyed it so much that it was really a pleasure to look on. The bugler (horn player) however said: 'I cannot bear the black stuff,' at the same time handing me half of two huge slices of bread and butter laid one over the other. Next he drew forth a bottle of wine. 'Will the gentleman take a drink?' I took a vigorous pull, but was suddenly forced to desist, and make a wry face, as it tasted like 'Drei-Männer' wine. 'Home produce,' said the player, 'but the gentleman has spoilt his German taste in Italy.'

The room should contain a cabinet for holding tools for general purposes, and specimens of wood. Where several classes receive instruction in the same room, a set of tools should be appropriated to each group of boys who in turn occupy the same bench. This set of tools may be provided at the cost of 15s. Besides these tools, some few larger and more expensive tools are required for general use, the cost of which, for each centre, should not exceed £12.

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Nearly all educationists have pointed out the many advantages of enabling children at an early age to realise the connection between *knowing* and *doing*. Comenius has well said: 'Let those things that have to be done be learnt by doing them.' Rousseau has pithily expressed a similar idea in saying, '*Souvenez-vous*

* Time must be left for cleaning the classroom, removing shavings and arranging the work executed.

qu'en toute chose vos leçons doivent être plus en actions qu'en discours ; car les enfants oublient aisément ce qu'ils ont dit et ce qu'on leur a dit, mais non pas ce qu'ils ont fait et ce qu'on leur a fait.' Locke, speaking of the education of a gentleman—for in his day the education of the poorer classes was scarcely thought of—says: 'I would have him learn a trade, a manual trade;' and Emerson, in the choice words, 'Manual labour is the study of the external world,' tersely states the whole aim and purpose of my remarks. 'The introduction of manual work into our schools is important,' says Sir John Lubbock, 'not merely from the advantage which would result to health, not merely from the training of the hand as an instrument, but also from its effect on the mind itself.' Rabelais, Montaigne, Pestalozzi, Fröbel, Combe, Spencer, and others have urged the importance of practical teaching, of studying things before words, of proceeding from the concrete to the abstract. A very valuable and interesting report has recently been issued by a committee of the School Board for London, of which Mr. Bousfield was chairman, in which it is recommended 'that special manual instruction should be given under the following principles: (1) That manual work be always taken in connection with school teaching of underlying sciences and drawing; (2) That no special trade be taught.' The Report further states: 'Woodwork supplies the most convenient mode of giving manual instruction to elder boys. The material is cheap and easy of manipulation, and can be made illustrative of the intellectual work of the school.'

In what I have said I have endeavoured to show that workshop instruction may and should be made a part of elementary instruction; that, as an educational discipline, it serves to train the faculties of observation, to exercise the hand and eye in the estimation of form and size and the physical properties of common things; that the skill acquired is useful in every occupation of life, and is especially serviceable to those who are likely to become artisans, by inducing taste and aptitude for manual work, by tending to shorten the period of apprenticeship, by enabling the learner to apply to the practice of his trade the correct methods of inquiry which he has learnt at school, and by affording the necessary basis for higher technical education.

In this country we frequently complain that children leave school at too young an age, before they have had time to properly assimilate the knowledge they have acquired, with the result that they soon forget a great part of the little they have learnt. At the age of fifteen or sixteen, when they begin to feel the want of technical instruction, they are wholly unprepared to avail themselves of the opportunities for obtaining it now brought within their reach. A large part of what the nation spends on education is thus practically wasted. It is to remedy this state of things that continuation schools and recreative classes are much needed. But there can be little doubt, if elementary education were made more practical, that parents would be more willing, even at some sacrifice, to let their children benefit by it. They are often led to take their children away from school because they do not see much use in the 'schooling.' Of course the desire to secure the child's early earnings operates in very many cases; but I am convinced that it would be easier to persuade parents to forego these earnings if the school teaching had more direct reference to the work in which the children are likely to be subsequently engaged.

I have already shown that workshop instruction is of great value as an introduction and a help to the study of practical science. Of the importance of science teaching in elementary school instruction I shall speak in the next article.

(*To be continued.*)

Model Answers to Certificate Questions, Christmas, 1887.

Male and Female Candidates.

FIRST YEAR.

German.

Male Candidates may answer questions in *two* Languages; *Female* Candidates in *one* only.

TWO *hours allowed for this Paper for Male Candidates;* THREE *hours for Female Candidates.*

N.B.—German words must be written in English characters.

SECTION I.

Translate into English:—

(*a*) Das Feuer loderte nun recht luſtig im Walde, der Morgen war friſch, wir ſetzten uns alle rings umher auf den Raſen und zwei von den Muſikanten nahmen ein Töpfchen, worin Kaffee und auch ſchon Milch war, vom Feuer, holten Brod aus ihren Manteltaſchen hervor, und tranken abwechſelnd aus dem Topfe, und es ſchmeckte ihnen ſo gut, daß es ordentlich eine Luſt war anzuſehen. Der Waldhorniſt aber ſagte: „Ich kann das ſchwarze Geſöff nicht vertragen," und reichte mir dabei die eine Hälfte von einer großen, übereinander gelegten Butterſchnitte, dann brachte er eine Flaſche Wein zum Vorſchein. „Will der Herr nicht auch einen Schluck?" Ich that einen tüchtigen Zug, mußte aber ſchnell wieder abſetzen und das ganze Geſicht verziehen, denn es ſchmeckte wie Drei-Männer Wein. „Hieſiges Gewächs," ſagte der Waldhorniſt, „aber der Herr hat ſich in Italien den deutſchen Geſchmack verdorben."

(*b*) Athemloſer hatte nie eine Gemeinde ihrem Seelenhirten gelauſcht und inbrünſtiger niemals im ſtillen Gebet ſich geſammelt, als da jetzt der ehrwürdige alte Mann ſeine dürren Hände erhob und über die Ausziehenden und Zurückbleibenden den Segen ſprach. Auch war keine heilige Handlung jemals andächtiger begangen worden, als die, deren Schauplatz nun, nachdem Geſang und Orgel verſtummt waren, das Gotteshaus wurde.

(*c*) Parse fully:—nahmen, abwechſelnd, gelegten, verderben, andächtiger.

(*a*) The fire blazed cheerfully in the forest, the morning was fresh, and we all sat down round about on the turf. Two of the musicians took a little pot, in which were milk and coffee, from the fire, and produced some bread out of their cloak-pockets. They drank one after another out of the pot and they enjoyed it so much that it was really a pleasure to look on. The bugler (horn player) however said: 'I cannot bear the black stuff,' at the same time handing me half of two huge slices of bread and butter laid one over the other. Next he drew forth a bottle of wine. 'Will the gentleman take a drink?' I took a vigorous pull, but was suddenly forced to desist, and make a wry face, as it tasted like 'Drei-Männer' wine. 'Home produce,' said the player, 'but the gentleman has spoilt his German taste in Italy.'

(*b*) Never had a community listened more breathlessly to the pastor of their souls, and never (had a community) more ardently united in silent prayer than when now the venerable old man raised his withered hands and pronounced the benediction over those who were about to depart and those who remained behind. Moreover, no holy deed was ever more devoutly undertaken than that (deed), the scene of which, after the organ was silent, and the singing was over, was the house of God.

(*c*)

nahm·en—irreg. or strong verb, imperf., indic., act., 3rd., plur. of nehm·en (nahm, genommen), agr. with its subj. zwei.

ab·wechsel·nd—adj. used adverbially, modifying nahmen.

ge·leg·t·en—past part. used adj., fem., sing., dat. case, agr. with Butter·schnitte, which is gov. by von.

ver·derb·en—past part. of strong inseparable verb, ver·derb·en (ver·darb, ver·dorb·en), conjugated with hat.

an·dächt·ig·er—adj. used adverbially, modifying war begangen worden.

SECTION II.

Translate into German:

We are at the village. All is quiet in the street; the houses are shut up, here and there a window is open, but nobody looks out of it. The swallows fly near the ground, and have no occasion to avoid any one. At the fountain by the townhall are other swallows, who drink, survey one another sagely, twitter, and hold a council, as if the village belonged to them alone. Distinguished water-wagtails trip up to them, wag their tails (schwänzeln), and are quite silent, as if they would thereby announce that they knew all, and knew it far better.

Wir sind an dem Dorfe. Alles ist ruhig in der Straße; die Häuser sind geschlossen, hie und da ist ein Fenster offen aber Niemand sieht hinaus. Die Schwalben fliegen nahe an dem Boden und finden es nicht nöthig Jemanden zu vermeiden. An der Quelle bei dem Rathhause sind andere Schwalben, die trinken, sehen einander klug an, zwitschern und halten eine Versammlung als ob das Dorf ihnen allein gehörte. Auserwählte Bachstelzen trippeln ihnen entgegen, schwänzeln, und schweigen, wie wenn sie dadurch sagen wollten, sie wissen alles, und kennen alles viel besser.

SECTION III.

1. What kinds of nouns are (as a rule) of the neuter gender? Give examples.

2. Write in German: (*a*) The days are shorter in winter than in summer. (*b*) The days are shortest in winter. (*c*) The twenty-third of November, 1833. (*d*) Which book do you wish to see? (*e*) I leave that alone. (*f*) There are men who cannot see.

3. What cases are governed by the prepositions während, bei, seit, ohne, respectively? Give examples.

4. Write down the second person singular of the present indicative, and the past participle, of beißen, erlöschen, genesen, messen, schelten, werfen.

(1) (*a*) The generic names of animals are neuter, as das Kind, das Pferd, das Rind, das Schwein, das Huhn, das Schaf; (*b*) diminutives ending in chen and lein are neuter, as das Mädchen, das Fräulein; (*c*) collective nouns beginning with ge are neuter, as das Gebirge; (*d*) most nouns beginning with ge are neuter; (*e*) all infinitives used as nouns are neuter, as das Leben, life; das Wissen, knowledge; (*f*) undeclined adjectives used as nouns, as das Berliner Blau, Prussian blue; (*g*) names of letters, musical notes, etc., as das A; (*h*) any *quoted* word is neuter, as ein großes Ich, a great I; das Aber, *the (word) but*; (*i*) names of countries, provinces, towns, as (das) Frankreich (das) Baiern; (*j*) nouns ending in tum (thum), nis, sal, sel, are mostly neuter, as das Bisthum, bishopric; das Ereignis, occurrence; das Scheusal, monster; das Räthsel, riddle.

(2) (*a*) Im (= in dem) Winter sind die Tage kürzer als im Sommer. (*b*) Im Winter sind die Tage am kürzesten. (*c*) Den drei und zwanzigsten November, achtzehn hundert drei und dreissig. (*d*) Welches Buch wünschen Sie zu sehen? (*e*) Ich lasse es sein. (*f*) Es giebt Menschen die (or welche) nicht sehen können.

(3) Während governs the genitive, as während des Prozesses, during the lawsuit; während sometimes takes dative, as während dem Regen, during the rain; bei always governs dative, as bei meinem Freund, at my friend's; seit always governs dative, as seit jener Zeit, since that time; ohne always governs accusative, as ohne deinen Bruder, without thy brother.

(4)

INFIN.	2ND SING. PRES. INDIC.	PAST PARTICIPLE.
beiss·en.	du beiss·est.	ge·biss·en.
er·lösch·en.	„ er·lösch·est or „ er·lisch·est	er·losch·en.
genes·en.	„ genes·est.	gen·es·en.
mess·en.	„ miss·est.	ge·mess·en.
schelt·en.	„ schilt·st.	ge·schelt·en.
werf·en.	„ wirf·st.	ge·worf·en.

Male and Female Candidates.

SECOND YEAR.

German.

Male Candidates may answer questions in *two* languages; *Female* Candidates in *one* only.

TWO *hours allowed for this Paper for Male Candidates*; THREE *hours for Female Candidates.*

N.B.—German words must be written in English characters.

SECTION I.

Translate into English:—

(*a*) Der Fremde wußte nicht, ob er sich schämen, ob er zürnen oder lachen sollte, widerstreben oder folgen. Wie ein paar Kampfhähne standen sich beide eine Weile beobachtend gegenüber; der kleine Hund mitten inne, knurrend und bellend, fuhr dem Schultheiß gegen die Waden.

(*b*) Ein böses Jahr kam über das Land, ein plötzlicher Kriegslärm alarmirte die deutschen Grenzländer im Osten, darunter auch unsere Provinz. Die furchtbaren Folgen eines heftigen Landschreckens wurden schnell fühlbar. Der Verkehr stockte, die Werthe der Güter und Waaren fielen, jeder suchte, das Seine zu retten und an sich zu ziehen, viele Kapitalien wurden gekündiget, große Summen, welche in kaufmännischen Unternehmungen angelegt waren, kamen in Gefahr.

(*a*) The friend knew not whether he ought to be ashamed, be angry or to laugh, resist or obey. Like two game-cocks both stood for a time opposite one another on their guard; the small dog between them, growling and barking, flew at the magistrate's calves.

(*b*) A bad year came over the land; a sudden cry of war alarmed the people of the eastern frontiers, and amongst the rest, our province. The terrible consequences of the violent panic in the country were quickly perceptible. Commerce was stopped, the value of goods and merchandise fell, every man tried to save and keep his own, much capital was called in, and large sums of money, which were invested in mercantile transactions, ran great risks.

Translate into English:—

(*a*) Vergebens widerstreben wir dem König,
Die Welt gehört ihm; wollen wir allein
Uns eigensinnig steifen und verstocken,
Die Länderkette ihm zu unterbrechen,
Die er gewaltig rings um uns gezogen.
Sein sind die Märkte, die Gerichte, sein
Die Kaufmannsstraßen, und das Saumroß selbst,
Das auf dem Gotthardt ziehet, muß ihm zollen.
Von seinen Ländern wie mit einem Netz
Sind wir umgarnet rings und eingeschlossen.

(*b*) Ich lebte still und harmlos — das Geschoß
War auf des Waldes Thiere nur gerichtet,
Meine Gedanken waren rein von Word —
Du hast aus meinem Frieden mich heraus
Geschreckt, in gährend Drachengift hast du
Die Milch der frommen Denkart mir verwandelt;
Zum Ungeheuren hast du mich gewöhnt —
Wer sich des Kindes Haupt zum Ziele setzte
Der kann auch treffen in das Herz des Feind.

(*a*) In vain, by force, we strive against the king,
The world belongs to him; (in vain) resolve
Resistance stern to make and brace ourselves
To burst the chains which neighbouring lands
have forged,
Which chains around us he now firmly draws.
The markets all and courts to him belong,
The merchants' paths are his, the packhorse self,
Which o'er St. Gothard goes, must pay him toll.
By his possessions, as within a net,
We are ensnared and 'compassed round about.

(*b*) Harmless and quietly I lived—my shafts
Against the forest-beasts alone were aimed,
Guileless and free from murder were my thoughts—
By terror thou hast chased away my peace;
To dragon's deadly poison hast thou changed
The milk of all my kindly, friendly thoughts;
With monstrous crime I am familiar made—
Who can his child's loved head his target make,
The same can also pierce his foeman's heart.

SECTION II.

Translate into German:—

Whenever I approached a peasant's house towards night-fall, I played one of my most merry tunes, and that procured me not only a lodging, but subsistence for the next day. I once or twice attempted to play for people of fashion, but they always thought my performance odious, and never rewarded me even with a trifle. This was to me the more extraordinary, as whenever I used in better days to play for company, when playing was my amusement, my music never failed to throw them into raptures, and the ladies especially: but, as it was now my only means, it was received with contempt: a proof how ready the world is to underrate those talents by which a man is supported.

So oft ich gegen Abend mich einer Bauerhütte näherte, spielte ich eines von meinen lustigen Stückchen, und das verschaffte mir nicht nur eine Herberge, sondern auch Unterhalt für den folgenden Tag. Ein oder zwei Mal versuchte ich es vor Leuten von Mode zu spielen; aber mein Spiel däuchte ihnen immer odiös, und sie gaben mir nie die geringste Kleinigkeit dafür. Dies war mir um so ausfallender, als, so oft ich in bessern Tagen, wo Flötenblasen nur meine Unterhaltung war, etwas vortrug, mein Spiel die Gesellschaft jedes Mal, und besonders die Damen, entzückte. Jetzt aber, wo es mein Unterhalt war, wurde es mit Verachtung angehört — ein Beweis, wie bereitwillig die Welt ist, Talente gering zu schätzen, aus welchen Jemand einen Erwerb macht.

SECTION III.

1. Explain the construction of the following two lines, and translate them accurately:—

Es hieß, er denk' ihn ganz daran zu kürzen
Mit einem Bischofshut ihn abzufinden.

2. What is the force of soll in the line „Ich soll der Mörder werden meines Kinds!" and of läßt in „Nur schlecht Gesindel läßt sich sehn"?

3. How is the pronoun wer used? Give examples.

4. Give the first person singular of the present, imperfect, and perfect tenses of the compound verb beistehen.

5. Explain the force of the adverbs in the sentences: Der Augenblick ist da, mich zu befreien. Wo kommt er her? Sonst war ich selber mit in Feld und Wald. Der Landvogt wird noch heute von dort erwartet.

(1) Es hieß, er denke, etc., it was said (that) he thought to lessen him completely thereby and to satisfy him with a bishop's mitre. Verbs of *declaring, answering, thinking*, etc., when used in the imperfect tense (hieß), take the subjunctive mood after them, with or without daß. The verb may be in the imperfect or (as here denke) in the present subjunctive. If daß be used the *verb* must be placed *last*, but if daß be omitted the verb is placed as in the English order.

(2) 'I *am to* (I *must*) be the murderer of my child!' = '*Am I* to (*must* I) be the murderer, etc.?' 'Only the wretched rabble appears.' Sehen lassen = to show; sich sehen lassen = to appear. Lassen = to cause, when followed by an infinitive which is then translated in English by the *passive* infinitive.

(3) Declension of wer. (It has no plural.)

	MAS. & FEM.		NEUT.	
N.	wer	who?	was	what?
G.	wessen	whose?	wessen	of what?
D.	wem	to whom?	wem	to what?
A.	wen	whom?	was	what?

Wer *is used interrogatively*. Wer ist da? Who is there? Wer seid ihr? Who are you (plural)? Wessen Buch ist das? Whose book is that? Wem haben Sie mein Buch gegeben? To whom have you given my book? Wen hat der Bruder gefragt? Whom did the brother ask? Was denken Sie? What do you think? Was für einer, e, es = what sort? Wer *is used as a relative pronoun when* der *precedes or follows it*, as—

Wer sich des Kindes Haupt zum Ziele setzte,
Der kann auch treffen in das Herz des Feind.

Was as a relative = *that which*, French *ce qui, ce que*, as Nehmen Sie, was ich da sage, ja nicht als einen Vorwurf auf, = *what I say* = *ce que je dis*. Wer er auch (immer) sei = *whoever* he may be: was auch = *whatever*.

(4) Pres., ich stehe bei: imperf., ich stand bei: perf., ich bin beigestanden.

(5) The hour of freedom *has come* (lit., *is there, i.e., here*). *Whence* (woher), does he come? (*i.e., here*, towards the speaker). Wo geht er hin? *Whither* is he going? (*i.e., yonder*, hin, towards a third person). *Formerly* I myself was *there* (*i.e., with* any person) in field and forest. The governor is expected from *there, this very day (before the day is over.* Noch implies that there is *still* (noch) time for the governor to come *to-day).*

(To be continued.)

—o—

Statistics for Teachers.

BY W. H. HARVEY, B.A. (LON.)

Captain Cuttle's well known dictum with respect to making notes of facts as soon as found holds good with special force in connection with statistical information. Many school books which are excellent in other respects have their value impaired by the antiquated character of their statistics. It is with a view to enabling teachers to put Captain Cuttle's advice into practice by correcting their text-books themselves, that the following items have been collected.

Population, &c.—The estimated population of England and Wales in the middle of last year 1887 was 28,247,000, of whom 18,041,000 are ascribed to town districts and the remaining 10,206,000 to country districts. The estimated number of persons in Scotland at the same period was 3,991,000. In respect to area England and Wales together stand credited

with 37,319,000 statute acres, Scotland with 19,639,000, and Ireland with 20,323,000; the last named country had an estimated population in the middle of 1885 of 4,963,000 persons.

The Registrar-General's returns give the following as the estimated populations of 31 large towns in the United Kingdom at the middle of 1887:—

	inhabs.		inhabs.
London	4,215,192	Portsmouth	137,917
Liverpool	592,991	Oldham	134,158
Glasgow	524,039	Sunderland	129,684
Birmingham	441,095	Brighton	118,186
Manchester	377,529	Blackburn	116,844
Dublin	353,082	Bolton	112,354
Leeds	345,080	Cardiff	104,580
Sheffield	316,288	Preston	102,283
Edinburgh	258,629	Birkenhead	97,703
Bradford	224,507	Derby	94,006
Nottingham	224,230	Norwich	92,848
Bristol	223,695	Huddersfield	90,034
Salford	218,658	Wolverhampton	80,847
Hull	196,855	Halifax	79,207
Newcastle	157,048	Plymouth	77,127
Leicester	143,153		

Imports and Exports.—With respect to the Imports and Exports of the United Kingdom in 1887 the following lists may be interesting to teachers, since the items are arranged in the order of their declared values for the year (the values being also appended) and the lists consequently show the relative importance of the various articles from a commercial point of view.

IMPORTS (1887).

	£
Grain and Meal	47,819,000
Provisions	40,526,000
Raw Cotton	39,807,000
Wool	25,983,000
Metals	16,618,000
Sugar and Molasses	16,515,000
Silk	13,302,000
Timber	11,989,000
Tea	9,859,000
Seeds	6,092,000
Hemp and Jute	5,847,000
Fruits	5,771,000
Wines	5,468,000
Coffee and Chicory	4,334,000
Tobacco	3,409,000
Hides	3,132,000
Flax	2,708,000
Oils	2,326,000
Spirits	2,012,000
Rice	1,878,000
Indigo	1,673,000
Tallow	1,074,000
Guano	186,000
Making, with many others, a total value of	£361,935,000

EXPORTS (1887.)

	£
Cotton Manufactures	59,577,000
Iron	25,000,000
Woollen Manufactures	20,585,000
Cotton Yarn	11,379,000
Machinery	11,146,000
Coals and Culm	10,176,000
Linen Manufactures	5,455,000
Woollen Yarn	3,970,000
Apparel	3,941,000
Copper and Brass	3,005,000
Hardware	2,920,000
Leather Manufactures	2,469,000
Haberdashery and Millinery	2,349,000
Silk Manufactures	2,326,000
Beer and Ale	1,678,000
Books, Printed	1,175,000
Lead and Tin	1,147,000
Spirits	1,018,000
Linen Yarn	939,000
Stationery	831,000
Salt	525,000
Soap	451,000
Silk Yarn	439,000
Plate and Watches	329,000
Candles	181,000
Butter	156,000
Cheese	57,000
Making, with many others, a total value of	£221,398,000

Big Ports.—According to the *South Wales Daily News* the following is a list of the ten largest ports of the world arranged in their order of precedence. The tonnage appended is the amount entered inwards and cleared outwards during one year, and does not include mere coasting trade which simply indicates the trade which any particular nation has with itself. The Per-Centage added in brackets after the tonnage shows the increase per cent. in fifteen years, and may therefore be taken as a fair criterion of the future prospects of the several ports.

1st	London	12,165,326 tons	(46 p. c.)
2nd	New York	11,886,801 ,,	(94 p. c.)
3rd	Liverpool	9,944,918 ,,	(16 p. c.)
4th	Marseilles	8,376,871 ,,	(102 p. c.)
5th	Hamburg	7,578,837 ,,	(86 p. c.)
6th	Cardiff	7,250,376 ,,	(152 p. c.)
7th	Tyne Ports	6,995,501 ,,	(46 p. c.)
8th	Antwerp	6,801,890 ,,	(75 p. c.)
9th	Genoa	5,406,769 ,,	(170 p. c.)
10th	Bilbao	5,274,452 ,,	(427 p. c.)

Although it is satisfactory to note that four of these ten big ports are British, the fact that from a per-centage point of view they do not (with the exception of Cardiff) seem to keep pace with the foreigners is not so pleasing. It appears indeed that the position of London as the first port in the world is doomed, and that New York will very soon take its place. It may be remarked that the above statistics are obtained from the Shipping returns for the years 1886 and 1887.

The following five ports, of which it will be noticed three are British, ought perhaps to be added to the above list, although they are to a great extent merely 'ports of call' for orders, or for 'transhipment,' or for 'coaling,' and not ports for the import and export of goods in the sense the others are:—

1st	Hong Kong	9,080,390 tons	(143 p. c.)
2nd	Malta	8,884,059 ,,	(109 p. c.)
3rd	Gibraltar	8,609,730 ,,	(120 p. c.)
4th	Port Said	5,767,656 ,,	(396 p. c.)
5th	Constantinople	5,195,242 ,,	nil.

British Steamships.—With respect to the tonnage of mercantile steam shipping the British position is unapproachable, for not only is it much larger than that of any other nation, but it actually surpasses by nearly a million tons all the rest of the world put together. The British fleet of steamers registered in 1885 no less than 4,293,115 tons with an increase of 257 per cent. during the preceding fifteen years, while the whole combined foreign fleet of steamers registered but 3,308,511 tons, with an average increase of only 102 per cent. In this foreign fleet was included also the vast tonnage of steamers on the rivers and lakes of the United States, amounting to 1,308,511 tons with 48 per centage of increase.

In 1886 France was credited with possessing 500,000 tons of steam merchant ships, Germany 453,000, and Italy with 144,000 tons.

Oral Teaching: The Preparation of Lessons and of Notes of Lessons.

BY JOSEPH H. COWHAM, F.G.S.,

Master of Method: Westminster Training College.

In the following chapters it is proposed to furnish help to pupil teachers and others in the preparation of their lessons. The course will include directions for lessons in all the subjects of school instruction illustrated by typical 'Notes of Lessons' in each branch of school study.

Oral Teaching a form of Conversation.—We acquire readily and retain permanently that which we converse about. Our knowledge of a given subject may be limited, but by speaking to others who have fuller knowledge our area of information becomes widened, errors are corrected, that which we already know is confirmed, and the whole subject becomes indelibly fixed in the mind.

In teaching a class of children the teacher converses orally, in turn, with all his pupils, and if he has the full attention of his class the conversation throughout the lesson is shared by all its members.

When all the scholars in a class thus share in its work we have that condition of oral teaching which is most effective in brightening the entire school life and work.

A few lessons of a conversational kind taken with the sole object of arousing the united thought and combined effort of a whole class will be found of high educational value even though the information imparted cannot be utilized on the day of examination.

Children should be encouraged to speak.—Mr. Fitch in his Lectures on Teaching says: 'If the teacher does all the talking and the pupil only responds with single words the questioning is bad. The great object should be with the minimum of your own words to draw out the maximum of words and of thought from him.' This is very sound advice; it has been repeated in text-books of school method; it is impressed upon the student teacher and pupil teacher in lectures and by personal advice; the fault, however, of the teacher speaking far too much and the pupil far too little still manifests itself in almost every lesson. In the advice which these chapters are intended to offer to young teachers on the preparation and the giving of their lessons, the importance of arousing the thought and afterwards of exercising the speech of their pupils will be constantly kept in view.

(1) If **an object or a picture** be brought before the class it is not sufficient for the teacher to exhibit it and to talk about it. The children must be allowed to examine it for themselves; if the object or picture cannot be submitted to all for personal inspection, allow one or more to take it in hand, and encourage these to state what they see to the entire class.

Next to speaking himself it is important that the scholar should listen to the speech of a fellow scholar. Children learn to speak more quickly and easily from mixing with and talking to other children than from hearing the speech of adults.

(2) **A grammar lesson** provides abundant opportunity for the exercise of speech on the part of the scholar. After a few typical examples have been supplied by the teacher and the point or principle in grammar which they illustrate has been seized by the class, then call upon the scholars to make other examples which similarly illustrate the principle or rule under discussion. When apt examples can thus be formed by the class they afford reliable evidence that the rule is known. The next and higher effort will be to allow the pupils to state the truth which their examples illustrate. In this way the grammar lesson may be made an excellent means of exercising the powers of speech which the children possess.

Correct speech is closely connected with sound thought, so connected in fact that they act and re-act upon one another, for whilst no one can speak correctly who does not think clearly, so no one can indulge in loose and incorrect speech without weakening his power of clear thought. The young teacher is therefore strongly advised to form early the habit of speaking well himself and then of requiring correct speech on the part of his class.

It is surprising how soon the speech of a group of children working together can be improved. If a teacher who has not practised his class in speaking in complete sentences will test his scholars the next time he takes them for an oral lesson he will find that not more than one child out of ten will attempt a complete reply.

If, for example, a process in Arithmetic is being explained—Twenty sheep are bought at the rate of two pounds each, and a boy is asked how to find the total cost; the reply will be 'Multiply.' The answer is no doubt correct, in so far as the boy's words exhibit to us the process he would employ; he should, however, be encouraged to say, 'Multiply the two pounds by twenty,' or still better' Multiply the cost of one by the number of sheep bought.'

Single word answers on the part of scholars as a rule should be discouraged. Children should be led to amplify them into complete sentences, and very rarely indeed should a question be so formed as to require single words for answer.

Avoid the elliptical form of question. The answers are very readily supplied, and the teacher is apt to be misled by his apparent success. A habit of using the elliptical form of question is easily contracted, and is very difficult to correct, and when extensively indulged it is very weakening in its effects both on the thought and the speech of the class.

So far three truths are briefly sought to be established.

(1) That oral teaching should as far as possible be conversational—that anything of the nature of a lecture should be avoided.

(2) That as expression by speech serves to fix and give directness to our thought, the teacher should use language carefully himself and require accurate and complete statements from his scholars.

(3) That children should in every way be encouraged to exercise their powers of speech during the progress of a lesson, and that all forms of questioning which foster incomplete statements on the part of the scholar should be avoided.

NOTES OF A BIBLE LESSON ON 'THE SIN OF ACHAN'—Josh. vii., 19—21 verses.

CLASS.—Senior Division of———School———.

TIME.—Thirty-five minutes.

INFORMATION AND LESSONS.

1. Introduction and statement of the main facts of the narrative.

(*a*) Israelites take Jericho.

(*b*) Command concerning the spoil.

(*c*) Spies sent to Ai; 3000 men defeated, 36 slain.

(*d*) Distress of Israelites followed by their Prayer.

Lesson I.

Prayer in time of distress.

(*e*) Sin discovered by casting lots.

(*f*) Achan accused before the assembled multitude.

2. Joshua's Address.

(*a*) My son = no expression of anger on the part of Joshua.

(*b*) Give Glory to God.

God's Omniscience.

(*c*) Make confession to God. Tell me now what thou hast done.

Lesson II.

'Be sure your sin will find you out.'

3. Achan's Answer.

Indeed I have sinned against the Lord:—

(*a*) **I saw**:— (1) A Babylonish Garment very costly.
(2) 200 shekels of silver = £25.
(3) A wedge of gold.

(*b*) **Sin of covetousness.**

(*c*) And took: **sin of theft.**

Lesson III.

The danger of desiring what is not our own; if not checked it may lead to theft.

(*d*) They are hid in the earth.
(1) Troubled conscience.
(2) Stolen goods of no value to him.

Revision of steps in Achan's Sin.
(1) Sees, thinks about the goods.
(2) Desire arises, watches for opportunity.
(3) Takes, and hides in his tent.

Lesson IV.

One sin frequently leads to another.

4. The Punishment of Achan's sin.

(*a*) Himself.
(1) A troubled conscience.
(2) Exposure before all Israel.
(3) Death by Stoning.

(*b*) Others.
(1) His whole household suffer with him: always so with sin.
(2) 36 men slain before Ai.

TEACHING HINTS AND ILLUSTRATIONS.

(*a*) Narrate vividly (1) the taking of Jericho, and (2) the command made by God concerning the Spoil.

Enforce (*b*) It is the '*Key to the Story.*'

(*c*) Describe Ai. Show on a map. Small town. No fear on the part of Israelites setting out against it. **Picture the sudden return and defeat.**

(*d*) State Joshua's perplexity. The Israelites filled with fear. God had aided them at Jericho, he would surely aid them again. In their misery they '*pray to God.*' **Enforce the Lesson.**

(*e*) Describe the scene:—
(1) All Israel assembled.
(2) Achan, who thought himself secure, stands out as the culprit.
(3) Joshua addresses him.
Read the passage with the children.

(*a*) State that whilst sorry for the sin and its consequences Joshua did not manifest hatred towards the sinner.

(*b*) By giving proof to the assembled Israelites of **God's Omniscience** by making **a full confession of guilt.**

Picture the guilty one, he only knew what sin had been committed. Now he is discovered.

Ask for this passage.

Read this over impressively. It conveys, without any comment, the wretched state of Achan.

(*a*) Briefly describe each. Enforce clearly that there was '**Nothing wrong in viewing them.**' We visit museums for the purpose of seeing such things.

(*b*) Picture the man lingering near; desire to have them arises. Now Achan **breaks a Commandment.** Ask children to name it.

(*c*) He did more. Ask for the second Commandment broken. Give advice to children 'To turn from objects if they find themselves devising means to obtain them.'

(*d*) Picture Achan, unable to rest. Ask what makes him uneasy? No one sees him: **Conscience.** He cannot use his ill-gotten gains.

Ask individual children for each step.

And for the lesson this enumeration of crimes teaches.

Each lesson, as it is taught, may be repeated by the children, and the whole of them written out at the close of the lesson.

(*a*) (1) Refer again to hiding in the tent; children will say what this showed. (2) Refer again to the assembled Israelites and Achan standing out as the criminal. (3) Briefly state death without entering into minute details.

(*b*) State the fact, and thus lead the children to see the effects of crime upon:—
(1) Whole families.
(2) Entire communities.

Knitting Maps.

BY MRS. J. D. HARRIS.

HEELLESS STOCKING.

This absurd looking pattern is in reality a very comfortable stocking, and has several merits. In the first place, men will like it in the summer, as it is much cooler than an ordinary stocking, and thrifty housewives will certainly approve of it as it not only takes much less wool, but also saves both time and trouble; but it must be observed that it does not answer as a sock, as it requires to be well gartered.

4 oz. of fingering for a full sized stocking.
4 pins. No. 15 Chamber's bell gauge.
28 stitches on each pin.
Knit 2, purl 2 for 2½ inches.

A. Cast off all the stitches *loosely*.

B. Without breaking off your wool pick up 28 *stitches* again on each pin. Knit *plain* 10 *inches*.

C. Drop every other stitch. This leaves 14 on each pin.

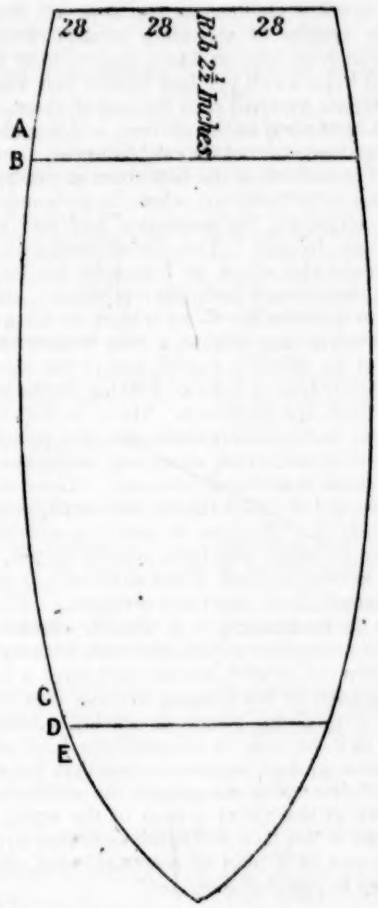
D. You must now add some stitches, otherwise the toe will be too small.
(This is best done by picking up and knitting the loop that is below the stitch on the pin, which is the stitch of the last round.) Add 6 stitches on 2 pins, and 8 on the other.
Now as each pin is knitted alike, you should mark one pin which will be the 1st in all succeeding rounds. Knit 2 rounds.

To Decrease for the Toe.

E *Knit 6. Knit 2 together. *Repeat for the whole round. Knit 6 rounds.
*Knit 5. Knit 2 together. *Repeat for the whole round. Knit 5 rounds.
*Knit 4. Knit 2 together. *Repeat. Knit 4 rounds.
*Knit 3. Knit 2 together. *Repeat. Knit 3 rounds.
Knit 2. Knit 2 together. *Repeat. Knit 2 rounds.
Knit 1. Knit 2 together. *Repeat.

Now knit 2 together till only 7 stitches are left. Put one on a pin. Knit the other 6 together and cast off.

Now pull out the stocking till the dropped stitches are all run down to the ribbing.



Pestalozzi.

BY THE REV. CANON WARBURTON, M.A.,

Formerly Her Majesty's Inspector of Training Colleges for Schoolmistresses.

CHAPTER IV.

PERSONAL RECOLLECTIONS.

THE author has recently, and quite unexpectedly, been put in possession of some original MSS. written from Yverdun Castle in the years 1819—22, and is permitted, by the kindness of the writer's daughter, to give a few extracts from them. It seemed desirable that, being chiefly of a personal character, these extracts should follow the account of Pestalozzi's life, and precede that of his system. The letters are numerous and interesting, but the special information bearing upon Pestalozzi is so much mixed up with matters of a private nature, that it cannot always be communicated to the general reader. The writer of these documents, the late Dr. Mayo, so well known in later life in connection with his school at Cheam, and with the Home and Colonial Training College—was, when a young man, engaged for some years as chaplain and English instructor in Pestalozzi's great institution at Yverdun, and the letters from him which follow will, it is hoped, be read with interest, as giving the fresh and unstudied expression of the writer's experiences of the place and of the man.

'1819.

'Yverdun.—On the margin of a lake, the length of which the eye is not certain that it defines, a collection of houses presents itself; a church steeple rises above the roofs, and near it four towers of no great elevation at the four angles of a large building, arrest your attention. . . Observe it a little more attentively:—one tower, you perceive, is much higher than the other three; all circular and covered with something like an inverted "pottle" of tiling. They are connected by

a plain frontage with a heavy sloping roof, pierced with irregular windows, and deformed with various appendages....Without grandeur, picturesque beauty, elegance or neatness, without excellence in form or colour, it presents the most uninteresting *mélange* of incongruous parts I ever beheld. This delectable *morçeau* of Swiss architecture you approach through a miserable avenue of starveling poplars, which you behold with more than ordinary disgust, from the disappointed hope which you had formed that when you quitted France you had seen the last of them....

'I was conducted to the château, and introduced to the principal members of the establishment. Several of them had assembled in the best room of the building, and among them Pestalozzi, whom, to do honour to the English clergyman, the institution had had washed, shaved, and dressed. This circumstance made the double salute with which he honoured me less overpowering than some I have since received. But you wish me to describe him:—he is then, to use a phrase more expressive than elegant, a little weazen old man, upwards of 70, stooping a good deal in the shoulders, but apparently from a habit of looking on the ground, and not from age or decay. There is nothing very remarkable in his countenance, no very peculiar expression of benevolence, no strong indication of a powerful mind, that I could discern. There is an air of abstraction, but that I think a very ambiguous sign, and it shows that the mind is prone to wander from the sphere in which the body actually moves, but it does not indicate whither it has wandered, or whether it is vigorously and efficiently occupied. His walk, when he is by himself, is a shuffle, effected by a curvilinear movement of his legs which, without lifting his feet from the ground, makes them form a kind of oval, completed by his bringing his toes into contact. When he is receiving guests, or leaving a room with strangers in it, he adds to the shuffle a kind of jerk, which, however, does not reach lower than his ankles.

'Schmid, the active manager of the institution, has much more of the air of a man of the world....The general cast of his face and figure indicates strength: he strikes you as a man of powerful mind, devoting its energies to practical purposes.'

'1819.

'It is delightful to live under the same roof with Pestalozzi: every action of his life is characterised by the most exuberant philanthropy. Had (this) been checked by a little more prudence, it would perhaps have produced more benefit to mankind.'

'1819.

'Things go on here pretty well. For myself I am quite satisfied, but Schmid wants in heart what P. wants in head. He (Pestalozzi) is a strong instance of the necessity of a little worldly prudence: the want of it has involved him in difficulties and hardships through life: has cooled his friends, heated his enemies, cramped his exertions for the good of others.'

'1821.

While we were sitting at dinner on Saturday, the Crown Prince of Denmark was abruptly ushered into the room. We all jumped up from our chairs. Old P. was as brisk as a bee—did the honours with his usual grace; while the rest of the party, one by one, made their escape. I had the honour of being introduced. He is a fine-looking man, affable and easy in his manner. The Princess was affected even to tears at the examination of the little children, and both declared that had they been educated in the same manner their knowledge would have been more extensive and more clear. These are our gleams of sunshine. . . . One honest John Bull, who was accidently born a peer of the realm (good honest man, he could not help it)—has been to see us, and cried out to her ladyship, "Come don't dawdle here—it's nothing more than the English plan, only more troublesome."

'Mrs. —— is continually boring P. with the praises of G——, (a gentleman to whom he once addressed a series of letters on the philosophy of education, but) from whom P. is now entirely estranged as a philosopher. He answers not a word. It is amusing to see them together. The other day she told P. that G—— had picked up *his* most beautiful ideas. He said not a word. She then observed that G—— had seized the spirit of the system better than any other Englishman. P. was silent. She then turned round to me and made the same remark in French. I parried the question in a manner that made P. laugh heartily. Schmid told me afterwards that P. was hugely tickled with what I said, and recounted the whole circumstance, laughing most immoderately. The next time P. saw me he placed both his hands on my shoulders and fell to laughing and kissing, kissing and laughing, so that a bystander must have taken him for a fool.'

'1821.

(Dr. Mayo having had an acute attack of illness) 'Pestalozzi was terribly uneasy; he could not rest till the symptoms declared themselves more favourable. He said, "*J'ai eu crainte, comme un pauvre diable.*" He comes early in the morning to my bedside, kisses my hand when I place it in his, and when I tell him I am better he is quite delighted, and exclaims, "*Grâces à Dieu—grâces à Dieu!*"'

(To be continued.)

—o—

Jeanne d'Arc, by Lamartine.

TRANSLATED BY A. M. BOWER,

Late Master in University College School, London.

JEANNE D'ARC.	JOAN OF ARC.
VIII.	
'Gracieuse de visage, elle croissait	'Of beautiful features, she grew up
leste et forte de ses membres.	agile and strong of limb.
Dans ces temps où	In those times when
les femmes ne faisaient route qu'à cheval,	women always travelled on horseback,
elle allait, enfant, avec ses frères,	she went, when a child, with her brothers,
conduire les poulains de son père	to take her father's colts (or foals)
dans le préau du château des Isles	into the paddock of the "chateau des Isles"
où on les enfermait	where they were shut up
de peur des gens de guerre.	for fear of (wandering bands of) soldiers.
Il est vraisemblable que c'est ainsi	It is probable that this was the way
qu'elle se familiarisa avec les destriers,	in which she became familiar with horses (steeds),
que nulle main d'homme	which no man's hand

ne mania plus hardiment depuis.	has since handled more daringly.
Elle raconte aussi	She relates also
qu'elle allait quelquefois	that she used sometimes to go
avec les jeunes filles du village	with the young village girls
à la lisière des bois	to the border of the woods
qui bordaient les champs,	which formed the limit of the village fields,
sous un grand chêne,	under a large oak,
qu'on appelait dans le pays *l'arbre des Fées;*	which was called in the country "The Fairies' tree;"
que sous ce chêne	that under this oak
il y avait une fontaine ;	there was a fountain ;
que son eau avait la renommée	that its water was celebrated
de guérir les fièvres et les maladies ;	for curing fevers and diseases ;
qu'elle en avait puisé,	that she had drawn some of the water,
comme les autres, à cette intention ;	like the others, with this intention ;
que les malades, après leur guérison,	that the sick, after their cure,
avaient l'habitude d'aller s'asseoir	were in the habit of going to sit down
et se délasser sous son ombre ;	and rest under its shade ;
que les fleurs de mai croissaient	that May flowers grew
autour de la source,	round the fountain,
et qu'en temps d'été	and that in summer
elle les cueillait avec ses compagnes,	she gathered them with her companions,
pour en tresser des chapeaux	in order to weave garlands with them
à la statue de la Notre-Dame de Domremy.	for the statue of Our Lady of Domremy.
La fille de sa marraine lui disait	The daughter of her godmother told her
que les fées ou les dames	that the fairies or the ladies
apparaissaient par aventure en ce lieu	appeared by chance in that spot
et qu'elle-même les avait vues.	and that she herself had seen them.
Quant à Jeanne,	As regards Joan,
elle ne les avait jamais vues.	she had never seen them.
Mais il est bien vrai	But it is quite true
que les jeunes filles	that young girls
suspendaient des chapelets de fleurs	hung up garlands
aux basses branches de l'arbre ;	on the lower branches of the tree ;
qu'elle avait fait comme les autres ;	that she had acted like the rest ;
que quelquefois ses compagnes	that sometimes her companions
emportaient les bouquets	used to carry away the bouquets
en s'en allant,	when they went away,
que d'autres fois	that at other times
elles les laissaient sur l'arbre ;	they left them on the tree ;
que, depuis le moment où	that, from the time when
elle avait conçu de délivrer la France,	she had conceived the idea of freeing France,
elle n'allait presque plus jamais	she hardly ever went again,
s'ébattre ainsi sous le chêne des Fées ;	to play under the Fairies' oak ;
qu'elle peut y avoir dansé	that she may have danced there
avant son âge de raison	before she knew what she was doing
avec les enfants, et surtout eschanté,	with the children, and especially sung there,
mais qu'elle ne croit pas	but that she does not believe
y avoir dansé	that she danced there
une seule fois depuis ;	a single time since ;
qu'il y avait aussi,	that there was also,
en face de la porte de son père,	before her father's door,
un autre bois voisin de la maison,	another wood near the house,
mais qu'il n'y avait pas là d'apparitions ;	but that there were no apparitions there ;
qu'à l'époque où	that at the time when
sa mission lui fut révélée,	her mission was revealed to her,
son père lui avait bien dit,	her father had warned her,
en la grondant,	while scolding her,
que le bruit courait	that the report ran
qu'elle avait pris ses inspirations	that she had received her inspiration
sous l'arbre des Fées ;	under the Fairies' tree ;
qu'elle lui avait répondu	that she had replied
que cela n'était pas ;	that such was not the case ;
qu'un prophète du pays	that a prophet of the land
disait bien que du bois Chênu	had predicted that from the oak wood
sortirait une jeune fille	should come forth a young maiden
qui ferait des merveilles,	who would perform wonders,
mais qu'à cela même	but that even to this (prophecy)
elle n'avait pas donné foi !...'	she had given no credence.'
Elle se complaisait à rappeler	She found pleasure in recalling to mind
dans sa prison ses souvenirs d'enfance.	(when) in her prison the memories of her infancy.
Elle s'y réconfortait	She found comfort in it
comme d'une fraîcheur de son matin,	as in the freshness of her morning,
et elle écrivait ainsi,	and she thus wrote,
sans le savoir,	without knowing it,
ces années obscures de sa vie	these obscure years of her life
dans lesquelles on aime	into which we love
à plonger du regard,	to look searchingly (lit. *to plunge with our looks*),
pour voir de quelle obscurité	to see out of what obscurity
est sortie la gloire et	our glory has emerged
de quelle félicité le martyre.	and from what (former) happiness our martyrdom.
Un de ces prophètes populaires	One of these popular prophets
qui sèment les rumeurs de l'avenir	who scatter prophecies of the future
à tout vent,	broadcast (lit. *to every wind*),
bien sûr que la crédulité	quite convinced that the credulity
naturelle aux âges d'ignorance	natural to ages of ignorance
les recueillera, l'enchanteur Merlin,	will accept (believe) them, the enchanter (conjurer) Merlin,
fameux dans les poèmes de l'Arioste,	celebrated in the poems of Ariosto,
avait écrit que les calamités du royaume	had written that the disasters of the kingdom
viendraient d'une femme dénaturée,	would proceed from an unnatural woman,
et que le salut viendrait	and that its salvation would come
d'une jeune et chaste fille.	from a young and chaste maiden.
Ce bruit remuait l'imagination	This saying stirred the imagination
du peuple dans ces provinces	of the people in these provinces
et pouvait susciter dans l'esprit	and was calculated to arouse in the mind
de chaque jeune vierge	of each young virgin
la pensée involontaire	the involuntary thought

de réaliser en elle la prophétie.	of fulfilling in herself the prophecy.
La beauté méditative	The meditative and contemplative
et recueillie de Jeanne,	beauty of Joan,
en attirant les yeux des jeunes hommes,	while attracting the eyes of the young men,
intimidait la familiarité.	repelled all familiarity.
Plusieurs cependant,	Several however,
charmés de sa grâce et de sa modestie,	smitten with her grace and modesty,
la demandèrent à ses parents.	asked her in marriage from her parents.
Elle s'obstinait à rester seule et libre,	She persisted in remaining single and free,
on ne sait par quel pressentiment	we know not from what presentiment
qui lui disait sans doute	which no doubt whispered to her
qu'elle aurait à enfanter un jour,	that she was destined to become the mother some day,
non une famille, mais un royaume.	not of a family, but of a nation.
L'un de ses prétendants,	One of her suitors,
plus passionné,	more ardent (than the rest),
osa réclamer son cœur	had the presumption to claim her hand
comme un droit,	as a right,
jurant en justice	and to swear in a court of law
qu'elle lui avait promis	that she had plighted to him
sa foi de mariage.	her marriage vows.
La pauvre fille honteuse, mais indignée,	The poor girl, ashamed but indignant,
comparut à Toul devant les juges	appeared at Toul before the justices
et démentit par serment	and contradicted on her oath
ce calomniateur par amour.	this slanderer through love.
Les juges reconnurent le subterfuge	The judges saw through the lie
et la renvoyèrent libre à la maison.	and sent her home free.

Grammatical Notes, Questions, Sentences, and Pieces for Translation to Jeanne d'Arc.

CHAPTER VII.

Devait = was to. Devoir = to owe, must, be obliged or bound, have to; to be (to); to be intended; should, ought. Vous devez (must) être fatigué. Comme vous *avez dû* souffrir = how you *must have* suffered. Il a dû payer le dégât = he has had (= been obliged) to pay for the damage. Cela ne se doit pas = that must not be done. Je le dois = I ought to or must do it. Je *dois* lui répondre demain = I *am to* answer him to-morrow. Je crois *devoir* lui répondre = I think I *ought* to answer him. Il semblait *devoir* réussir = he seemed *sure* to succeed. Vous *deviez* sortir = you *were obliged* to go out, were to go out, ought to have gone out. Vous *devriez* sortir = you *ought* to go out. Vous *auriez dû* sortir = you *ought to have* gone out. By carefully studying the above examples the student will henceforth find no difficulty in translating this difficult verb. Que donne l'aisance: note the order. When the subject (l'aisance) after *que* is longer than the predicate (*donne*) the subject is then placed after the verb. This rule is very important in translating correctly the text.

Study the following sentences: *Quelques* défauts *que* vous *ayez* (subj.) = whatever faults you may have. *Quels que* soient vos défauts = whatever your faults may be. *Quelque* (indeclinable) grands *que soient* vos défauts = *however* great your faults may be. *Quelque* (indecl.) savamment *que* vous parliez = *however* learnedly you may speak. Quelque (indecl.) cinq cents hommes = some (*i.e.* about) 500 men. Rule: quelque is invariable before adjectives, adverbs, and cardinal numbers, but before a plural noun it takes *s*: *Etaient* allées = *had* gone. The verb être not avoir must be used with intransitive verbs like aller, tomber, arriver, sortir, partir, devenir, entrer. Et se charger du fardeau = and to load herself with the burden. Bien que, quoique, afin que, que, jusqu'à ce que, à moins que and que = si, take the subj. Elle ne savait ni: savoir = pouvoir and in this sense takes only one negative. Ce métier où; où = dans lequel; où = quand; où que = wherever. Que de fois = combien de fois. Et sur ce qu'elle aimait = and on *the fact that* = ce que.

(To be continued.)

—o—

The Glass of Water; or, Cause and Effect.

(Comedy in Five Acts.)

LE VERRE D'EAU; OU, LES EFFETS ET LES CAUSES.

(Comédie en Cinq Actes.)

Scene II.—*(continued).*

Masham.

Ce n'est pas facile.	It is not an easy task.

Bolingbroke.

Non...car la force brutale et matérielle,	No, for brute physical force,
les succès emportés à coups de canon	successes secured with cannon
étourdissent tellement le vulgaire,	so much amaze the common herd,
qu'il ne lui vient jamais à l'idée	that it never entertains the idea
qu'un général vainqueur puisse être un sot,	that a victorious general may be a fool,
un tyran ou un fripon...	a tyrant, or a rogue...
et lord Marlborough en est un!	and Lord Marlborough is one!
je le prouverai..je le montrerai	I will prove it...I will show
glissant furtivement sa main victorieuse	his victorious hand slipping stealthily
dans les coffres de l'État.	into the treasures of the State.

Masham.

Ah! vous ne direz pas cela...	Ah! you will not say that...

Bolingbroke.

Je l'ai écrit...je l'ai signé...	I have written...and signed it...
l'article est là...il paraîtra aujourd'hui...	the article is ready...it will appear to-day.
je le répèterai demain,	I shall repeat it to-morrow,
après-demain..tous les jours..	after to-morrow..every day..
et il y a une voix qui finit toujours	and there is a voice which always succeeds
par se faire entendre,	in making itself heard,
une voix qui parle encore plus haut	a voice which speaks louder
que les clairons et les tambours...	than clarions and drums...
celle de la vérité!...	I mean the voice of truth!
Mais pardon...je me croyais au parlement,	But forgive me, I thought I was in the House of Commons,
et je vous fais subir un cours de politique,	and I inflict on you a political lecture,
à vous, mon jeune ami,	on you, my young friend,
qui avez bien d'autres rêves en tête...	who have very different dreams in your head...
des rêves de fortune et d'amour.	dreams of fortune and of love.

Masham.

Qui vous l'a dit?	Who told you so?

Bolingbroke.

Vous-même !...Je vois très-discret
quand vous êtes éveillé ;
mais je vous préviens qu'en dormant
vous ne l'êtes pas.

Yourself !...I consider you very discreet
when you are awake ;
but I warn you that when you are asleep
you are not so.

Masham.

Est-il possible ?

Is it possible ?

Bolingbroke.

Je vous ai entendu vous féliciter
en rêve de votre fortune,
et vous pouvez me nommer
sans crainte la grande dame
à qui vous la devez.

I heard you congratulate yourself
in your dreams on your good fortune,
and you may tell me
without fear the name of the great lady
to whom you owe it.

Masham.

Moi ?

I ?

Bolingbroke.

A moins que ce ne soit la mienne !...
auquel cas je ne vous demande rien ?...
je comprendrai...

Unless it is my wife !
In which case I ask you nothing !
I shall understand.

Masham.

Vous êtes dans l'erreur !
je ne connais pas de grande dame !
Il est quelqu'un, j'en conviens,
qui, sans se faire connaître,
m'a servi de protecteur...
un ami de mon père...vous peut-être ?...

You are quite mistaken.
I know no great lady !
There is someone, I grant,
who, without making himself known,
has protected me...
my father's friend...yourself perhaps ?

Bolingbroke.

Non, vraiment...

No, indeed.

Masham.

Vous êtes le seul cependant
que je puisse soupçonner.
Orphelin et sans fortune,
mais fils d'un brave gentilhomme
tué sur le champ de bataille,
j'avais eu l'idée de demander
une place dans la maison de la reine :
la difficulté était d'arriver à Sa Majesté,
de lui présenter ma pétition ;
et un jour d'ouverture du parlement,
je me lançai intrépidement
dans la foule qui entourait sa voiture ;
j'y touchais presque
lorsqu'un grand monsieur,
heurté par moi, se retourne et,
croyant avoir affaire à un écolier,
me donne sur le nez une chiquenaude.

You are, however, the only one
that I can think of.
An orphan without fortune,
but the son of a worthy nobleman
killed on the field of battle,
I had an idea of asking
for a post in the Queen's household :
the difficulty was to see her Majesty,
to present my petition ;
and on the day of the opening of Parliament,
I rushed boldly
into the crowd which surrounded her carriage ;
I had almost reached it
when a tall gentleman,
against whom I had run, turned round and,
thinking he had to deal only with a scholar,
gave me a fillip on the nose.

Bolingbroke.

Pas possible !

You don't say so !

Masham.

Oui, monsieur...je vois encore
son air insolent, ricaneur...
je le vois, je le reconnaîtrais entre mille,
et si jamais je le rencontre...
Mais dans ce moment la foule,
en nous séparant,
m'avait jeté contre la voiture de la reine
à qui je remis ma pétition...
elle resta quinze jours sans réponse.
Enfin je reçois une lettre d'audience
de Sa Majesté !...
Vous jugez si je me hâtai
de me rendre au palais,
paré de mon mieux,
et à pied pour de bonnes raisons...
J'étais près d'arriver,
lorsqu'à deux pas de Saint-James,
et vis-à-vis d'un balcon
où se tenaient de belles dames de la cour,
un équipage, qui allait plus vite que moi,
m'éclabousse de la tête aux pieds,
moi et mon pourpoint de satin,
le seul dont je fusse propriétaire...
et pour comble de fatalité,
j'aperçois à la portière de la voiture...
ce même individu, l'homme à la chiquenaude...
qui riait encore...
Ah ! dans ma rage, je m'élançai vers lui,
mais l'équipage avait disparu,
et furieux, désespéré,
je rentrai à mon modeste hôtel,
ayant manqué mon audience.

Yes, sir, I see yet his insolent, sneering manner...
I see him yet, I should recognise him among a thousand,
and if ever I meet him...
But at that moment the crowd,
in separating us,
had thrown me against the Queen's carriage
to whom I handed my petition...
it remained 15 days without a reply.
At last I received a letter admitting me to an audience
with her Majesty !...
You may fancy what haste I made
to present myself at the palace,
dressed in my best,
and on foot for very good reasons.
I was nearly there,
when at two paces from St. James's,
and opposite to a balcony
where there were some beautiful ladies of the court,
a carriage, which was going faster than I was,
splashed me with mud from head to foot,
both my person and satin doublet,
the only one that I possessed,
and to crown my misfortunes,
I perceived at the carriage door,
this same individual, the man who had given me the fillip (snapped his fingers in my face)...
who was again laughing...
Ah ! in my rage, I darted after him,
but the carriage had disappeared,
and furious and desperate
I returned to my humble lodgings,
having missed my audience.

Bolingbroke.

Et votre fortune !

And your fortune !

Masham.

Au contraire ! je reçus le lendemain,
d'une personne inconnue,
un riche habit de cour,
et, quelques jours après,
la place que je demandais
dans la maison de la reine.
J'y étais à peine depuis trois mois,
que j'avais reçu
ce que je désirais le plus au monde,
un brevet d'enseigne
dans le régiment des gardes.

On the contrary ! Next day I received
from an unknown person,
a rich court dress,
and, a few days afterwards,
the appointment which I had solicited
in the Queen's household.
I had scarcely had that appointment three months,
when I received
what I longed for the most in the world,
an ensign's commission
in the Guards.

Bolingbroke.

En vérité ! Et vous n'avez aucun soupçon
sur ce protecteur mystérieux ?

Indeed ! And you have no idea
who this mysterious protector may be ?

Masham.	
Aucun !...il m'assure	None ! He assures me
de sa constante faveur,	of his constant favour,
si je continue à m'en rendre digne...	if I continue to make myself worthy of it...
Je ne demande pas mieux...	I ask nothing more...
ce qui me paraît seulement	the only thing that seems to me to be
gênant et ennuyeux...	inconvenient and troublesome
c'est qu'il me défend de me marier...	is that I am forbidden to marry.
Bolingbroke.	
Ah ! bah !	No ! really !
Masham.	
Craignant sans doute	Afraid, no doubt,
que cela ne nuise à mon avancement.	that that would be detrimental to my advancement.
Bolingbroke.	
[*riant.*	[*laughing.*
C'est là la seule idée	Is that the only idea
que cette défense ait fait naître en vous ?	that this prohibition has produced in your mind ?
Masham.	
Oui, sans doute.	Yes, undoubtedly !
Bolingbroke.	
[*de même.*	[*laughing.*
Eh bien ! mon cher ami,	Well ! my dear friend,
pour un ancien page de la reine	for an old page of the Queen
et pour un nouvel officier dans les gardes,	and a new officer in the Guards
vous êtes d'une innocence biblique...	you are of primitive (lit. Biblical) simplicity.
Masham.	
Comment cela ?	How so ?
Bolingbroke.	
[*de même.*	[*laughing.*
C'est que ce protecteur inconnu	Because this unknown protector
est une protectrice...	is a protectress.
Masham.	
Quelle idée !	What an idea !
Bolingbroke.	
Quelque grande dame,	Some great lady
qui vous porte intérêt...	who takes an interest in you.
Masham.	
Non, monsieur...	No, sir,
non, cela n'est pas possible !	that cannot be possible.

Translate into French the following sentences taken from the Verre d'Eau.

ACT I. SCENE II.

What is the matter (s'agir de)? The question is (s'agir de) to translate these sentences into French. If the question were to translate them into English—I have no objection. It will not break their heart (en mourir). I (thou, he, she, we, you, they) must have a book (say, il me faut un livre = there needs to me a book). I must do it now. I was compelled (me fallait) to do it. I shall be forced to do it. You should have (fallait) seen. You should (faudrait) see. You will have to dress yourself. We must have something to do. We still get the best of the bargain (y gagner). They must (devoir) be tired. How they must have (devoir) suffered. We have had (devoir) to pay. I am to (devoir) be there to-morrow. The country must (devoir) be beautiful. We think it our duty (devoir) to answer him. They were obliged (devoir) to go out. You ought to go out. They ought to have gone out. We *particularly wish* (tenir à) to go away. We *take an interest in* you. Whose is the victory? The question is to make the Parliament understand that. He was dressed in his best. Dost thou see it now (y être)? My father does not wish (avoir envie de) to leave them to me.

(To be continued.)

Quarterly Arithmetical Tests.

STANDARD I.—FIRST QUARTER.

1.	48	2.	340	4.	2×8;
	3		210		3×9;
	704				4×4;
	20	3.	198		5×6.
	325		14		

SECOND QUARTER.

1.	4	2.	703	4.	5×9;
	350		21		3×8;
	9				4×8;
	794	3.	453		6×5.
	30		428		

THIRD QUARTER.

1.	1	2.	204	4.	9×3;
	730		9*		2×7;
	713				10×2;
	45	3.	850		3×4.
	938		136*		

* To be dictated thus :—(1) Take 9 from 204. (2) Take 136 from 85c.

STANDARD II.—FIRST QUARTER.

1. Add together 4, 3694, 72000, 302, and 17,570.
2. Take 3,724 from 21,360.
3. 3,027 × 12.
4. 18,050 × 28.

SECOND QUARTER.

1. 34,027 − 15,829.
2. 5,047 × 196.
3. 20,003 ÷ 6.
4. 45d. = 29d. = 100d. =

THIRD QUARTER.

1. How much less is 36 than 36,000?
2. 39,048 × 2,009.
3. 11,479 ÷ 12.
4. Three bags contain altogether 100 marbles, one has 14 and another 43; how many are there in the third?

STANDARD III.—FIRST QUARTER.

1. 370, 241, 806 ÷ 29.
2. Find the dividend when the divisor is 198 and the quotient 4,952.
3. 295,065 ÷ 387.
4. Add together 2s. 6d., 3½d., 7s. 4d., and 4¼d.

SECOND QUARTER.

1. How often is 59 contained in 837,005?
2. £20,002 6s. 9d. + £129 10s. 6½d. + £260 11s. 9¼d. + £50 16s. 3½d. + £9,132 0s. 6¼d.
3. From £900,006 14s. 2½d. take £9 2s. 3d.
4. £3,004 19s. 9½d. + £27 6s. 11¾d. + £80,726 14s. 3½d. + £78 11s. 3½d. + £3 12s. 8½d. + £708 19s. 9¼d.

THIRD QUARTER.

1. Divide six million six hundred and six by 78.

2. Take three pence farthing from three hundred pounds.

3. £3,207 16s. 8¾d. + 3 half crowns + £59 6s. 0¼d. + £82,675 19s. 8½d. + £27 15s. 11¾d. + £8,216 13s. 10½d. + £257 15s. 3½d.

4. A horse and carriage are worth £59 16s. 3d.; the carriage cost £14 19s. 8¼d.; what is the value of the horse?

STANDARD IV.—FIRST QUARTER.

1. £13,729 12s. 8¼d. × 12.

2. £789 10s. 9d. × 7,019.

3. £2,741 18s. 9½d. ÷ 11.

4. Multiply the difference between £119 12s. 1½d. and £109 11s. 6½d. by thirty-six.

SECOND QUARTER.

1. £7,900 10s. 0½d. ÷ 56.

2. If a man earn 15s. 9½d. in a week, what would he earn in 39 weeks?

3. Reduce 2 tons 14 cwt. to half ounces.

4. How many weeks are there in 7,649,851 minutes?

THIRD QUARTER.

1. £1,036,954 13s. 0½d. ÷ 609.

2. How often is 2s. 6d. contained in £5 10s.?

3. Reduce 33 acres 3 roods to sq. yds.

4. A boy takes 2 ft. 6 in. at a step, and walks 3 miles 4 fur. 170 yds.; how many steps does he take?

STANDARD V.—FIRST QUARTER.

1. 9,652 articles at £7 2s. 9½d. each.

2. What shall I have to pay for $1,329\frac{1}{8}$ tons of sugar at £2 18s. 9¼d. per ton?

3. 12 bushels 2 pecks at £3 10s. 6d. per quarter.

4. What will be the cost of cutting 4 acres 3 roods 24 poles of grass at 6s. 7d. per acre?

SECOND QUARTER.

1. 78 sq. yds. 6 sq. ft. 96 sq. in. at 3s. 5½d. per sq. foot.

2. Bill:—2½ lbs. butter at 1s. 4d. per lb., 1½ lbs. cheese at 1s. 2d. per lb., 12 oz. lard at 10d. per lb., 2 doz. eggs at 8 for 1s., 2 turkeys' eggs at 3½d. each, 5 eggs at 1d. each.

3. Find the rent of a field for 3 years when £28 is paid for 8 weeks.

4. A man bought 3 lbs. 8 oz. of tea for 7s. 7d.; what would he pay for 2 cwt 1 qr. at the same rate?

THIRD QUARTER.

1. Take $\frac{1}{9} + \frac{1}{3}$ from $\frac{1}{2} + \frac{1}{3}$.

2. If the fare for 150 miles be 18s. 9d. how far can I travel for £6 1s. 10½d.?

3. Bill:—17 gal. @ 3½d. per pint, 4 doz. @ 1s. 9½d. each, 4 gross @ 9½d. per doz., 19 @ 6½d. each.

4. 27 acres 3 roods 25 poles at £1 8s. 8d. per acre.

STANDARD VI.—FIRST QUARTER.

1. Simplify $\frac{3\frac{1}{3} \text{ of } 5\frac{5}{8} \text{ of } 3\frac{5}{9}}{9\frac{3}{4} \text{ of } \frac{8}{33} \text{ of } 7\frac{1}{3}}$.

2. What number multiplied by $1\frac{3}{8}$ will produce $14\frac{3}{4}$?

3. Divide 1121·4 by ·534.

4. A. can do a piece of work in 4 days, and B. can do it in 6 days; in what time would they do it working together?

SECOND QUARTER.

1. Find the continued product of $\frac{17}{21}$, $\frac{126}{165}$, $\frac{4}{7}$ of $1\frac{2}{5}$, $\frac{95}{116}$ and $\frac{87}{135}$.

2. Multiply ·7575 by ·366.

3. Reduce 12s. $0\frac{3}{5}$d. to the dec. of half-a-guinea.

4. A. exchanged with B. 60 yds. of silk worth 7s. 3d. a yd. for 48 yds. of velvet; what was the price of a yard of velvet?

THIRD QUARTER.

1. Find the 4th proportional to the numbers 3, 3·75 and 40.

2. Simplify $\frac{2\frac{4}{11}}{2\cdot6} \div \frac{2\frac{7}{11}}{8\cdot7}$.

3. If the interest on £264 for 20 days be 10s. 9d. what is the rate per cent. per annum?

4. Reduce $\frac{4}{5}$ of $\frac{3}{7}$ of $7\frac{1}{2}$d. to the fraction of half-a-guinea.

STANDARD VII.—FIRST QUARTER.

1. In a class of 25 children 19 attended during the week, 5 were present on 5 days, 6 on $4\frac{1}{2}$ days, 3 on 4 days, 2 on $3\frac{1}{2}$ days, 1 on 3 days, 1 on 2 days, and 1 on $\frac{1}{2}$ day. Find the average number of days for each child in the class.

2. 23 per cent. of the population of a town of 30,000 people died in a year; find the number of deaths.

3. Simplify $\frac{1\frac{1}{4} - 1\frac{5}{12}}{1\frac{1}{4} + 1\frac{5}{12}} + \frac{7}{16} \text{ of } \frac{45}{42} - \frac{11\frac{1}{4}}{15}$.

4. A and B engage to do a piece of work for 30s. A could do it in 4 days, and B in 5 days; with the aid of C it is done in 2 days; how should they divide the money.

SECOND QUARTER.

1. In standard gold 22 parts out of 24 are pure gold, what percentage is dross?

2. A grocer used a weight which only weighs 15·75 ozs. instead of 1 lb., what per cent. does he gain by his dishonesty?

3. If 50 qrs. of wheat are sold at 77s. 8d. per qr. and 100 at 78s. 3d. per qr., what is the average price bushel?

4. Simplify $\frac{\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} + \frac{1}{10}}{\frac{1}{3} + \frac{1}{5} + \frac{1}{9} + \frac{1}{15}}$, and give the answer as a decimal.

THIRD QUARTER.

1. If 252 men dig a trench 210 yds. long, 3 wide, and 2 deep, in 5 days of 11 hrs. each, how many days of 9 hrs. each will 22 men require to dig a trench 420 yds. long, 5 wide, and 3 deep?

2. $\frac{\cdot375 \times \cdot375 - \cdot025 \times 0\cdot25}{\cdot375 - \cdot025}$.

3. What was the prime cost of an article which when sold for 12s. realised a profit of 20 per cent.?

4. Find the average of ·25, ·375, ·0125, ·36, and ·8.

ANSWERS.

STANDARD I.

	First.	Second.	Third.
1.	1,100.	1,187.	2,427.
2.	130.	682.	195.
3.	184.	25.	714.
4.	16; 27; 16; 30.	45; 24; 32; 30.	29; 14; 20; 12.

STANDARD II.

	First.	Second.
1.	93,570.	18,198.
2.	17,636.	989,212.
3.	36,324.	3,333 + 5.
4.	505,400.	3s. 9d.; 2s. 5d.; 8s. 4d.

Third.

1. 35,964.
2. 78,447,432.
3. 956 + 7.
4. 43 marbles.

STANDARD III.

	First.	Second.
1.	12,766,958 + 24.	14,186 + 31.
2.	980,496.	£29,575 5s. 10½d.
3.	762 + 171.	£899,997 11s. 11½d.
4.	10s. 5¾d.	£84,550 4s. 9½d.

Third.

1. 76,030 + 66.
2. £299 19s. 8¾d.
3. £94,445 15s. 0¾d.
4. £44 16s. 6¼d.

STANDARD IV.

	First.	Second.
1.	£164,755 12s. 3d.	£141 1s. 7¼d. + 10.
2.	£5,441,763 14s. 3d.	£30 15s. 10½d.
3.	£249 5s. 4d. + 6.	193,536 half-ounces.
4.	£361 1s.	758 w. 6 d. 9 h. 31 m.

Third.

1. £1,702 14s. 4d. + 192.
2. 44 times.
3. 163,350 sq. yds.
4. 7,596 steps.

STANDARD V.—First.

1. £68,911 5s. 2d.
2. £3,905 13s. 9$\frac{5}{11}$d.
3. £5 10s. 1¾d.
4. £1 12s. 2¾d.

Second.

1. £122 10s. 9½d.
2. 3s. 4d. + 1s. 9d. + 7½d. + 3s. + 7d. + 5d. = 9s. 8½d.
3. £546.
4. £27 6s.

Third.

1. $\frac{7}{12}$.
2. 975 miles.
3. £1 19s. 8d. + £4 6s. + £1 18s. + 10s. 3½d. = £8 13s. 11½d.
4. £39 11s. 11¾d.

STANDARD VI.

	First.	Second.	Third.
1.	$3\frac{9}{11}$.	$\frac{4}{5}$.	50.
2.	$10\frac{8}{11}$.	·27.	3.
3.	2,100.	1·1476190.	£3 14s. $3\frac{3}{11}$d. $\frac{1}{12}$q.
4.	$2\frac{3}{5}$ days.	9s. 0¾d.	$\frac{1}{48}$.

STANDARD VII.

	First.	Second.	Third.
1.	3·06 days.	$8\frac{1}{3}$.	350.
2.	6,900.	$1\frac{23}{28}$.	$\frac{1}{4}$ or ·4.
3.	1.	9s. $9\frac{1}{13}$d.	10s.
4.	A, 15s.; B, 12s.; C, 3s.	1·60546875.	·3575.

Pupil Teacher Examination Papers (Scotland).

31ST MARCH, 1888.

END OF FIRST YEAR.

FIRST PAPER.

(Two hours and a half allowed for this Paper.)

Grammar.

'I know *that* entertainments of *such* a nature are *apt* to raise dark and dismal *thoughts* in minds which are timorous; *but*, for *my own part*, though I am always serious, I do not know *what* it is to be *melancholy*.'

1. Analyse the above passage.
2. Parse fully the words in italics.

ANALYSIS.

Sentences	Kind	Connect.	Subject	Predicate	Object	Extensions
1. I know	Prin.	that	I	know	(2)	in minds (place)
2. that entertainments of such a nature are apt to raise dark and dismal thoughts in minds	Subord. noun to (1)		entertainments ……a nature	are apt	to raise…… thoughts (completion)	
3. which are timorous	Subord. adj. to (2)	which	which	are timorous		
4. but, for my own part, I do not know	Prin.	but	I	do not know	(5)	for my own part (reason)
5. what it is to be melancholy	Subord. noun to (4)	what	it—to be melancholy	is what		
6. though I am always serious	Subord. adv. of concession to (4)	though	I	am serious		always (time)

PARSING.

That—subord. conj., introd. noun sent.
such—indef. adj., qual. 'nature.'
apt—predic. adj., qual. 'entertainments.'
thoughts—com. noun, neut., plur., obj., gov. by 'to raise.'
but—co-ord. advers. conj., contrasting two complex sentences.
my own—comp. pronoun, possess. adj., qual. 'part.'
part—abstr. noun, neut., sing., obj., gov. by 'for.'
what—comp. rel. pron., equal to *that* + *which*, 'that' obj., gov. by 'do know' and 'which,' nom. after 'is,' in appos. with 'it.'
melancholy—predic. adj., qual. (one).

3. Distinguish between co-ordinate and subordinate conjunctions, and give a list of each class.

(3) Co-ordinate conjunctions join words or clauses and sentences which are independent of one another.

Subordinate conjunctions join clauses and sentences of which one is in a relation of dependence upon the other, or enters into its construction with the force of a noun, an adjective, or an adverb.

CO-ORDINATE CONJUNCTIONS.	SUBORDINATE CONJUNCTIONS.
And	That
But	As
Either—or	If
Neither—nor	Lest
Whether—or	Unless
Both—and	Though
	Although, &c.

Dictation.

Write from dictation, in a neat hand, with correct spelling and punctuation, the passage read by the Inspector.

Penmanship.

Write in large hand, as a specimen of copy-setting, the word 'Parenthetically.'

Write in small hand, as a specimen of copy-setting, the sentence 'In Saxon strength that Abbey frown'd.'

Arithmetic.

MALES.

1. Simplify $\dfrac{1\frac{3}{8}\text{ of }1\frac{1}{4}}{3\frac{3}{8}+\dfrac{5}{1\frac{1}{17}}}+\dfrac{4}{5+\dfrac{6}{7\frac{3}{8}}}$

$$\frac{1\frac{3}{8}\text{ of }1\frac{1}{4}}{3\frac{3}{8}+\dfrac{5}{1\frac{1}{17}}}+\frac{4}{5+\dfrac{6}{7\frac{3}{8}}}=\frac{\frac{3}{8}\times\frac{5}{4}}{\frac{27}{8}+\frac{5}{\frac{18}{17}}}+\frac{4}{5+\frac{6}{\frac{59}{8}}}$$

$$=\frac{\frac{15}{32}}{\frac{27}{8}+\frac{85}{18}}+\frac{4}{5+\frac{48}{59}}$$

$$=\frac{15}{1\,7}+\frac{284}{413}$$

$$=\frac{2045+4828}{6953}=\underline{\frac{6873}{6953}}.\ \text{Ans.}$$

2. Express the difference between £$1\frac{3}{5}$ and $\frac{3}{10}$ of a guinea as the fraction of half-a-crown.

$$\frac{\frac{3}{10}\text{ gui.}-£1\frac{3}{5}}{2\frac{1}{2}\text{s.}}=\frac{11\frac{3}{5}\text{s.}-10\frac{1}{2}\text{s.}}{2\frac{1}{2}\text{s.}}$$

$$=\frac{1}{2\frac{1}{2}}=\underline{\frac{2}{5}}.\ \text{Ans.}$$

3. Find the value of ·525 of £6 6s. 8d. + ·027 of £2 18s. 7d.

	£	s.	d.
·525 of £$6\frac{2}{3}$ = £$\frac{19\times\cdot525}{3}$	= 3	6	6
·027 of £2 18s. 7d. = £2 18s. 7d. × $\frac{27}{1000}$	= 0	1	7
	3	8	1 Ans.

4. A person has ·225 part of a mine; if he sells ·27 part of his share, what fractional part of the mine has he left?

(a) $\cdot225=\frac{225}{1000}=\frac{9}{40}$
$\cdot27\ =\frac{27}{100}=\frac{27}{100}$
(b) $\frac{27}{100}$ of $\frac{9}{40}$ = $\frac{27}{1000}$
(c) $\frac{9}{40}-\frac{27}{1000}=\frac{18-5}{80}=\underline{\frac{13}{80}}$. Ans.

FEMALES.

1. Find by Practice the value of 6 tons 12 cwt. 91 lbs. at £32 6s. 8d. per ton.

	£	s.	d.		
	32	6	8	= value of 1 ton	
			6		
	194	0	0	= ,,	,, 6 ,,
10 cwt. = ½ of 1 ton	16	3	4	= ,,	,, 10 cwt.
2 ,, = ⅕ ,, 10 cwt.	3	4	8	= ,,	,, 2 ,,
56 lbs. = ¼ ,, 2 ,,	0	16	2	= ,,	,, 56 lbs.
28 ,, = ½ ,, 56 lbs.	0	8	1	= ,,	,, 28 ,,
7 ,, = ¼ ,, 28 ,,	0	2	0½	= ,,	,, 7 ,,
	214	14	3½	= ,,	,, 6 tons, &c. Ans.

2. Make out in proper form, and duly receipt the following bill:—

5 boxes tea, each 3½ cwt., at 2s. 9d. per lb.
84 lbs. coffee, at 1s. 10½d. per lb.
3 barrels sugar, each 4 cwt. 56 lbs., at £3 6s. 8d. per cwt.
17 stones butter, at 1s. 3d. per lb.

Edinburgh, 31st March, 1888.

Messrs. Maxwell and Millar,
Bought of James Boyd.

	£	s.	d.
To 5 boxes tea, each 3½ cwt., at 2s. 9d. per lb.	269	10	0
,, 84 lbs. coffee at 1s. 10½d. per lb.	7	17	6
,, 3 barrels sugar, each 4 cwt. 56 lbs., at £3 6s. 8d. per cwt.	45	0	0
,, 17 stones butter at 1s. 3d. per lb.	14	17	6
	337	5	0

Paid 31st March, 1888
James Boyd.

3. Define the *Least Common Multiple*: find the L.C.M. of 9, 13, 15, 52 and 63.

The smallest number which can be divided by two or more others without a remainder is called the *least common multiple* of those others.

3 | 9, 13, 15, 52, 63
5, 52, 21
∴ L.C.M. = 21 × 52 × 5 × 3 = 16380. Ans.

4. Simplify $\frac{1}{5}+(1\frac{1}{3}-\frac{2}{3})-(\frac{1}{4}+\frac{1}{6})+\frac{1}{2}-(\frac{1}{4}-\frac{1}{6})$.

$$\tfrac{1}{5}+(1\tfrac{1}{3}-\tfrac{2}{3})-\left(\frac{6+4}{24}\right)+\tfrac{1}{2}-\left(\frac{6-4}{24}\right)=$$
$$(\tfrac{1}{5}+\tfrac{1}{3})-(\tfrac{10}{24})+\tfrac{12}{24}-\tfrac{2}{24}=$$
$$1-\tfrac{10}{24}+\tfrac{12}{24}=\underline{1}.\ \text{Ans.}$$

SECOND PAPER.

(Two hours and a half allowed for this paper.)

Geography.

1. Draw a map of Scotland, showing the mountains, rivers and capes.

2. Write a short account of Australia, under the heads of (*a*) climate, (*b*) productions, and (*c*) chief towns.

(2) Australia. (*a*) As the northern portion of this island-continent lies within the tropics, the climate is very hot, though the heat is tempered to some extent by the elevation of the land. The southern half has a temperature resembling that of Cape Colony, the average annual temperature of Melbourne being 60°. The interior is one of the most arid regions on the face of the globe. In winter the winds blow from the land to the sea, and in summer when the winds blow from the sea to the land the hot air retains as vapour such moisture as is not condensed on the edge of the plateau. Rains do occasionally fall in the interior in such quantity as to fill the watercourses; and this accounts for the possibility of bringing water to the surface in some places by means of artesian wells. The east coast strips are plentifully supplied with rain, and the monsoons bring it to the north and north-east, as in other tropical countries. North-west winds, corresponding to the south-west winds of Western Europe, bring rain to the south-west of Australia.

(*b*) The staple productions of Australia are gold, wool, and preserved meat. Gold was first discovered in 1851, and since then the country has been found to be rich in minerals of every kind. The colonists devote much attention to sheep-rearing, for which the vast extent and excellent quality of the pasture lands are well adapted.

(*c*) *Melbourne*, on the Yarra-Yarra, was founded in 1835 after the discovery of rich pastures in the neighbourhood of Port Philip Bay. It is the capital of Victoria. In the interior north-west of this town are *Ballarat* and *Sandhurst*, the former being the centre of the declining gold-digging region of Victoria, and the latter the growing centre of the region in which gold is obtained by the crushing of quartz. *Sydney*, capital of New South Wales, is the oldest city in Australia, and is beautifully situated on the magnificent harbour of Port Jackson. To the north is *Newcastle*, noted for coal, and *Bathurst* is in the interior. *Brisbane* is the capital of Queensland. *Adelaide*, capital of South Australia, is built on the only part of the coast where vessels have a safe basin in which to load alongside a wharf. *Perth* is the capital of West Australia.

3. Enumerate the various ways in which rivers originate, with illustrative examples.

A river may have its source—that is, its longest branch may originate—in (*a*) a spring, like the Jordan and the Danube; in (*b*) a lake, as the St. Lawrence, the Amazon, and probably the Nile; or in (*c*) a glacier, like the Rhone.

History.

1. Estimate the effect of the Roman rule in Britain upon the civilisation of the country. Mention the chief Roman remains which are still in existence in Britain.

(1) The Romans held the island as a military settlement in which the towns were mainly peopled by the conquerors, and the country was studded with the houses of the gentry and landholders of the ruling race. The Roman settlers brought with them the splendour, the refinement, and the practical genius which distinguished their civilisation. Agriculture was so far developed that Britain could export corn largely to the Continent. Marshes were drained, woods cut down and orchards planted. The youthful Britons were trained like Romans, and drafted off to serve in the armies.

Remains of Roman walls may still be seen at Chester, York, Chichester and Lincoln; at Caerleon (in South Wales) and at Bath were temples, theatres, and palaces. Even now in places once held by the Romans, the workman who digs below the surface comes on Roman pottery and tesselated pavements, and in our museums may be seen the pins of bronze with which the Roman ladies fastened their hair.

2. Give a short account of the circumstances which led to the Norman invasion of England, with the dates.

(2) About 1057 it is said that Harold was entrapped by William into the famous oath upon concealed bones of saints to the effect that he would assist William to obtain the English crown, and become a vassal for his earldom. Harold, however, gained popularity by successes which he gained over the Welsh, and by the action which he took in Northumbria against his brother Tostig. On the death of Edward the Confessor, 1066, he was by the Witenagemote elected king. Duke William, however, instantly demanded possession of the kingdom, to which Harold replied by a repudiation of the oath, and an assertion of his rights as conferred by the Witenagemote. Harold followed up the defiance by the expulsion from the realm of all the Norman nobles who had acquired land from Edward the Confessor and William promptly prepared for invasion.

Composition.

1. Write the substance of the passage read to you; or

2. Write a letter on 'Christmas,' or 'Keeping Pets.'

Edinburgh,
31st March, 1888.

Dear Sir,

The return of Christmas calls yearly for a new crop of sentiment. It has become quite a custom in Scotland to hold Christmas as our fellow-subjects the English do. In former times New Year's Day was the great Scotch holiday of the winter season, but it is now giving place to Christmas, which brings the family together for eating, drinking, and general festivity and congratulation. December 25th, generally accepted as the birthday of the Saviour, is gradually losing its sacred character, and becoming entirely a secular holiday. The houses are decked with a profusion of evergreens, and the literature of the season has a certain gorgeousness about it from the reward cards of the school to the brilliantly illuminated copies of favourite authors, and the pretty books of Kate Greenaway and other clever limners.

Holiday games, pies and plum-pudding make the festival pleasant to the young, and the elders live over again the yule-tide of former years in watching the merriment of the children. Christmas tales, coloured by superstition, are many, and the advent of the day bringing 'peace and good-will to man' is welcomed with chimes of bells, and, in the more primitive parts of England, by carol-singing.

These are but a few desultory ideas on the happy time of Christmas.

I am, dear Sir,
Yours faithfully,
WILLIAM TEACHER.

H. M. S., Esq.,
Inspector of Schools.

Latin.

FIRST STAGE.

(*The answers to be written on a separate paper.*)

1. Give a list of words which take *ius* and *i* in the genitive and dative singular. Decline together *hoc numen* and *gravis orator*.

2. Translate and parse the following forms:—*rexerat, amatu, audienda, moneretur, fore, regat.*

3. Translate into English, and parse the words in *italics*:—
   (*a*) *Claudite* portas *cives.*
   (*b*) Boni magistri fideles servos *habent.*

OPTIONAL.

Translate into Latin:—
   (*a*) Ye have heard the words of the wise man.
   (*b*) The wolf is in the fields; the shepherds have been warned.

1. The following words take *ius* and *i* in the genitive and dative singular, viz.:—alius, uter, alter, alter-uter, uter-libet, utervis, unus, solus, totus, ullus, nullus, uterque, and neuter, ille, ipse, and iste.

	SINGULAR.		PLURAL.	
N.	Hoc	numen	Haec	numina
G.	Hujus	numinis	Horum	numinum
D.	Huic	numini	His	numinibus
A.	Hoc	numen	Haec	numina
Ab.	Hoc	numen	His	numinibus

	SINGULAR.		PLURAL.	
N.	Gravis	orator	Graves	oratores
G.	Gravis	oratoris	Gravium	oratorum
D.	Gravi	oratori	Gravibus	oratoribus
A.	Gravem	oratorem	Graves	oratores
V.	Gravis	orator	Graves	oratores
Ab.	Gravi	oratore	Gravibus	oratoribus

2. *Rexerat*—(he had ruled), 3rd pers., sing., plu-perf., indic. of a verb of the 3rd conj., *rego, rexi, rectum, regĕre.*
amatu—(to be loved), 2nd supine of a verb of 1st conj., *amo, amavi, amatum, amāre.*
audienda—(requiring to be heard), nom., sing., fem., gerundive of a verb of 4th conj., *audio -ivi -itum -ire.*
moneretur—(he should be advised), 3rd pers. sing., imperf., subj., pass. of a verb of 2nd conj., *moneo-ui-itum-ere.*
fore—(to be about to be), fut. inf. of the defect. verb, *forem.*
regat—(he shall rule), 3rd pers. sing., fut., indic. of a verb of 3rd conj., *rego, rexi, rectum, regere.*

TRANSLATION.

3. (*a*) Shut the gates, Citizens!
   (*b*) Good masters have faithful servants.

PARSING.

Claudite—2nd pers., pl., pres., imper., verb, 3rd conj., *claudi-si-sum-ĕre.*
cives—voc., pl., com. noun, 3rd decl., civis-is.
habent—3rd pers., pl., pres., indic., verb, 2nd conj., *habeo-ui-itum-ēre.*

OPTIONAL.

(*a*) Vos audivistis verba sapientis.
(*b*) Lupus in agris est; pastores sunt moniti.

END OF SECOND YEAR.

FIRST PAPER.

(*Two hours and a half allowed for this paper.*)

Dictation.

Write from dictation, in a neat hand, with correct spelling and punctuation, the passage read by the Inspector.

Penmanship.

Write in large hand, as a specimen of copy-setting, the word 'Parenthetically.'

Write in small hand, as a specimen of copy-setting, the sentence 'In Saxon strength that Abbey frown'd.'

Arithmetic.

MALES.

1. At what rate per cent. will £850 amount to £1,136 7s. 6d. in $7\frac{1}{2}$ years at simple interest?

£1,136 7s. 6d. − £850 = £286 7s. 6d.

£850 : £100 } :: £286$\frac{3}{8}$: Rate
$7\frac{1}{2}$ yrs. : 1 yr. }

$$£\frac{2291 \times 100 \times 1}{8 \times 7\frac{1}{2} \times 850} = £\frac{2291 \times 200}{8 \times 15 \times 850}$$

$$= 4\tfrac{7}{17}\tfrac{9}{1}\tfrac{1}{1} \text{ p. c. Ans.}$$

2. By selling goods for £817 19s. I lost 9 per cent.; at what price should I have sold them so as to have gained $10\frac{1}{2}$ per cent.?

£91 : £110$\frac{1}{2}$ :: £817 19s. :

$$£\frac{817 \text{ 19s.} \times 221}{91 \times 2} = £\frac{16359 \times 221}{20 \times 91 \times 2}$$

$$= £^{20}\tfrac{13}{40}^{20} = £993 \text{ 4s. 6d. Ans.}$$

3. A person invests £500 in Indian Stock at 98$\frac{7}{8}$, and sells out at 104$\frac{1}{2}$; find his gain.

98$\frac{7}{8}$: 500 :: £5$\frac{1}{8}$: Gain

$$£\frac{45 \times 500 \times 8}{8 \times 791} = £\tfrac{2}{7}\tfrac{8}{9}\tfrac{0}{1}^{0}$$

$$= £28 \text{ 8s. } 10\tfrac{2}{7}\tfrac{3}{9}\tfrac{4}{1}. \text{ Ans.}$$

FEMALES.

1. Simplify $\left(3\frac{3}{7} + \frac{2}{10\frac{1}{2}} - \frac{5}{6} \text{ of } \frac{4}{21}\right) \times 1\frac{3}{4}$.

$$(\tfrac{1}{1}^{0} + \tfrac{4}{2}\tfrac{1}{1} - \tfrac{1}{6}\tfrac{0}{3}) \times \tfrac{7}{4} = \frac{42 - 10}{63} \times \frac{7}{4}$$

$$= \frac{32 \times 7}{63 \times 4}$$

$$= \tfrac{8}{3}. \text{ Ans.}$$

2. Reduce $\frac{1}{10}$ of $9\frac{3}{4}$ acres to the fraction of 1 ac. 2 ro. 33 poles.

$$\frac{\frac{1}{10} \text{ of } 9\frac{3}{4} \text{ ac.}}{1 \text{ ac. } 2 \text{ ro. } 33 \text{ pls.}} = \frac{\frac{1}{10} \text{ of } 1560 \text{ pls.}}{273 \text{ pls.}}$$

$$= \tfrac{1}{2}\tfrac{5}{7}\tfrac{6}{3}$$

$$= \tfrac{4}{7}. \text{ Ans.}$$

3. Explain the process of reducing a vulgar fraction to a decimal: reduce $\frac{3}{16}$, $\frac{2}{31250}$, and $\frac{3}{70}$ to decimal fractions.

Rule.—If the vulgar fraction is in its lowest terms, place the decimal point after the numerator and affix ciphers, divide by the denominator as in division of decimals till there is no remainder, or until the figures repeat. Place a point in the quotient before as many figures as there are ciphers affixed to the numerator. We thus divide by as great a number as that by which we multiplied the dividend and so give the quotient its proper value.

$$\tfrac{3}{16} = \frac{3{\cdot}0000}{16} = \underline{{\cdot}1875.}$$

$$\tfrac{2}{31250} = \frac{{\cdot}2{,}000{,}000{,}000}{512} = \underline{{\cdot}0005859375}$$

$$\tfrac{3}{70} = \frac{{\cdot}3000000}{7} = \underline{{\cdot}0428571}$$

4. If $\frac{3}{4}$ cwt. of coffee cost £3, at what price per lb. must it be sold to gain $\frac{1}{8}$ of the outlay?

$\frac{1}{8}$ of the outlay = 12s.

∴ £3 12s. ÷ $\frac{3}{7}$ of 112 = price required

$$= \frac{72\text{s.}}{48}$$

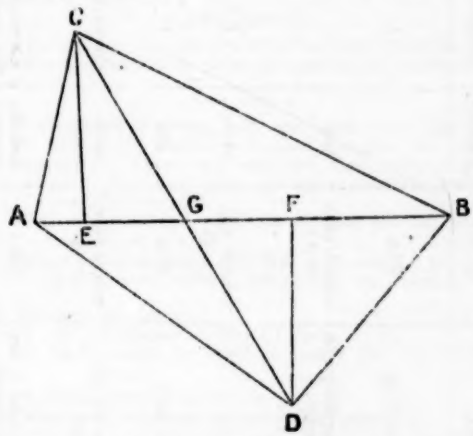
$$= \underline{1\text{s. } 6\text{d.}} \text{ Ans.}$$

Euclid.

1. To describe a parallelogram which shall be equal to a given triangle, and have one of its angles equal to a given angle.

Book I., Prop. 42.

2. If two equal triangles be upon the same base, but on opposite sides of it, the straight line joining their vertices is bisected by the base.



Let the two equal triangles ACB, ADB be upon the same base AB but on opposite sides of it then the straight line CD joining their vertices will be bisected in the point G where CD is cut by the base AB.

Since the altitude of equal triangles (that is the perpendicular distance between the parallels) upon the same side or on opposite sides of the same base must be equal, then by letting fall the perps. DF, CE, upon the base AB, the side CE is equal to the side DF, the right angle CEG is equal to the right angle DFG; and the angles EGC, FGD are equal (I. 15). Therefore (I. 26) the triangles CEG, DFG are equal in every respect and the side CG, is equal to the side DG, and therefore CD is bisected in the point G. Q. E. D.

3. What is meant by *superposition?* Write the enunciations of any propositions in which this process is used.

By superposition is meant the placing of one figure upon another as a method of proving whether their corresponding parts coincide with one another. Bk. I. Props. 4 and 8 are examples of superposition.

Grammar.

'I have been studying *how* I *may* compare
This prison *where* I live unto the world;
And *for* because the world is populous
And here *is* not a creature *but* myself,
I cannot do it.'

1. Analyse the above passage.

2. Parse fully the words in italics.

ANALYSIS.

SENTENCE.	KIND	CONNECT.	SUBJECT	PREDICATE	COMPLETION	EXTENSIONS
1. I have been studying	Prin.		I	have been studying		where
2. how I may compare this prison unto the world	subord. noun to (1)	how	I	may compare	this prison (dir. obj.) unto the world (indir. obj.)	
3. where I live	subord. adj. to (2)	where	I	live		
4. and I cannot do it	Prin.	and	I	cannot do	it	
5. for because the world is populous	subord. adv. to (4)	for because	the world	is populous		here
6. and (for because) here is not a creature but myself	(do.)	and (for because)	a creature but myself	(*a*) is not here; or, (*b*) is not		

PARSING.

How—indir. interrog. adv. mod. 'may compare.'
may—aux. defect. verb (*may, might*), indic., pres., 1st pers., sing., agr. with subj. 'I.'
where—subord. conj. (= in which) introd. subord. adj. sent.
for—prep. forming part of the elliptical conj. phrase 'for because (that)'
is—subst. verb *am, was, been*, indic., pres., 3rd pers., sing., agr. with subj. 'creature.'
but—prep. relat. 'is not a creature' and 'myself.'

3. Explain the construction of the following sentences:—
(*a*) He asked me where the boy lived.
(*b*) The spot where the hero fell is marked by a monument.
(*c*) I have sinned in that I have betrayed the innocent blood.

Sentence (*a*) is complex consisting of a principal clause 'He asked me,' and a subord. noun clause 'where the boy lived,' direct object of 'asked.'

(*b*) consists of a prin. clause. 'The spot is marked by a monument' and a subord. adj. clause 'where the hero fell,' qual. the subj. 'spot.'

(*c*) consists of a prin. cl. 'I have sinned,' and a subord. adv. cl. of reason 'in that I have shed innocent blood,' mod. the predicate 'have sinned.'

SECOND PAPER.

(*Three hours allowed for this paper.*)

Geography.

1. Draw a map of Italy, showing the mountains and rivers, and insert Rome, Naples, Florence, Venice, Milan, and Brindisi.

2. Give a short account of the chief products of the valley of the Ganges and of Ceylon respectively.

The valley of the Ganges by the overflowing of the river is rendered one of the most fertile regions of the globe. Of the stately trees one of the most valuable is teak, which rivals the oak in firmness and durability. Palm trees are the most noted of fruit-bearing trees. Rice, the chief food of the Hindoo, is the principal article of cultivation. Wheat, barley, millet and maize are also raised, besides the sugar-cane, the mulberry-tree, cotton, indigo, pepper and various kinds of delicious fruits. Attention is being given to the cultivation of the tea-plant which grows wild in Assam.

The soil of Ceylon is rich and luxuriant, producing coffee, sugar-cane, rice and pepper, with teak and other valuable woods. Plantations of cinnamon amid groves of cocoa-nut trees border the south-west coast for a hundred miles. The island abounds with gems, and there is an extensive pearl-fishery in the gulf of Manaar. The elephants of Ceylon are famed for their size and sagacity.

3. What is meant by a *degree of longitude*? What is its length in miles in Latitude 0° and Latitude 90°, respectively?

Circles are imagined as passing round the earth and through the poles. Each of these is divided into 360 intervals called degrees each of which subtends an angle of one degree (or $\frac{1}{90}$th of a right angle) at the centre of the earth.

A circle conceived as crossing these meridians (as they are called) at points 90° from each pole is called the *equator*. There is no natural starting point from which to measure longitude but it is now generally reckoned from the meridian passing through Greenwich Observatory. Longitude is measured by degrees which denote the angles which the planes of successive meridians make with one another. Since these meridians converge towards the poles and are most widely separate at the equator the distance covered by one degree of longitude diminishes continually as you approach the poles. Thus at the equator or latitude 0° it is rather more than 69 miles and at latitude 90° or at the pole it will be 0 miles.

History.

1. Give an account of the relations between Scotland and England during the reign of Edward I.

During the reign of Edward I. the throne of Scotland was claimed by several persons and the English king was asked to arbitrate between them. Claiming to be *overlord* he gave the throne to Baliol who after suffering much insult rebelled against his Lord Paramount. This led to the invasion of Scotland by Edward, who defeated the Scots and marched as far north as Elgin, exacting homage. Leaving the command to Surrey he returned to London. War soon broke out again and under the patriots Wallace and Bruce great progress was made towards the independence of Scotland. In 1306 the news that Bruce had been crowned at Scone roused the old 'Hammer of Scotland,' and he reached Carlisle, where he lay long on a sick bed. At Burgh-on-Sands his dying wish was that his bones should be carried at the head of the army till Scotland was subdued (1307).

2. Write short historical notes on Simon de Montford, Perkin Warbeck, and Cardinal Wolsey. Give in each case the leading dates.

Simon de Montford, Earl of Leicester, a Frenchman, married Eleanor, sister of Henry III. Headed the barons against the king and took him prisoner at Lewes, 1264. Formed the first House of Commons, 1265. Slain at Evesham, 1265.

Perkin Warbeck pretended to be the Duke of York, brother of Edward V. Encouraged by the Duchess of Burgundy and

James IV. of Scotland. Landed in Cornwall. Fled to Beaulieu Abbey. Surrendered on promise of life. Imprisoned in the Tower. Attempted to escape. Executed, 1499.

Cardinal Wolsey, born at Ipswich. Educated at Oxford. Appointed Dean of Lincoln, 1508; Bishop of Lincoln and Archbishop of York, 1514; Chancellor, 1515. Cardinal and Papal Legate, 1518. He lost all his offices except the See of York, 1529, and was arrested by orders of Henry VIII. Died on his way to London, 1530. Aged 59.

Composition.

Write a short essay on 'The sea,' or 'Glass.'

GLASS.

There are five or six kinds of glass which differ from one another not only in their use, but also in their composition and manner of manufacture. The glass for common windows is made by fusing together in a crucible at a very strong temperature, sand and soda, or sand and potash. For crown glass some saltpetre and lime are added to these ingredients. In order to give glass its proper shape and thickness for windows an iron tube is put into the molten glass and the lump which adheres to the end is blown into something like a big soap bubble. The place opposite to the blow-pipe is then opened and by whirling the blow-pipe round the hole opens and the bubble becomes a round and flat sheet. Sometimes the bubble is blown inside a wide smooth tube so as to form a hollow cylinder which is while soft laid open by a straight cut and flattened out. To make plate glass the pot of glass is emptied on a metallic table and rolled out by a metal roller. After cooling very slowly it is ground flat with sand and water, smoothed by grinding it with water and emery, and finely polished with iron-rust and water. The polishing is finished by rubbing two plates together, a little water and rust of tin being put between them. Crystal for salt-cellers, decanters, and 'cut' glass things generally contains some lead-rust.

SCHOOL MANAGEMENT.

Enumerate the qualities which should characterise the reading of a senior standard, and say what means should be adopted to cultivate each of them.

The qualities of good reading have been well summed up in these two—intelligence and expression. Reading to be intelligent must bring out the sense of the passage read, and to be expressive the tones of the voice must be adapted to the sense so as to bring it out with the best effect. Expressive reading can be obtained only by uttering the words with purity and distinctness, the former having regard to the vowels and the latter to the consonants. These results can only be obtained by persevering correction of provincialisms which are nearly all violations of vowel sounds, and by careful attention in the younger classes as to distinct utterance of all consonants requiring to be sounded. Correct accent and emphasis must be insisted on, the former having to do with syllables and the latter with words. Emphasis depends on the reader's knowing the sense of the passage and may be cultivated by intelligent questioning on the part of the teacher, whereas accent being acquired by imitation depends entirely upon a good ear and careful correction when necessary. Besides these a deliberate style with fair modulation of voice may be looked for in a senior class. With careful watching in the lower classes good reading should now be pretty general in common schools, and with the introduction of two sets of reading books, fluency in reading should be no longer the exception. The reading of the pupils almost entirely depends on the teacher, who should endeavour to acquire for the imitation of the scholars a correct style.

Latin.

SECOND STAGE.

(The answers to be written on a separate paper.)

1. What verbs in Latin govern the accusative and genitive? Give examples.

Verbs of accusing (*accuso, arguo*), convicting (*convinco, coarguo*), condemning (*damno, condemno*), and acquitting (*absolvo, libero*) govern the accusative and genitive—as: accusit me furti—he accuses me of theft; aliquem sceleris arguere—to accuse one of a crime.

2. Give a list of the personal pronouns. Explain how *se* is used in Latin.

The personal or substantive pronouns are *ego*, I; *tu*, thou; *nos*, we; *vos*, you; what is sometimes called the pronoun of the 3rd person is a *reflective* pronoun, which occurs only in the oblique cases and is the same in both the singular and plural and for all genders:—G. sui, D. sibi, Acc. sē or sēsē, Ab. sē, or sese.

3. Give the imperative active, and the imperfect subjunctive passive of *facio, fero,* and *nolo.*

IMPERATIVE.

	PRESENT.	FUTURE.	
Sing.	Plur.	Sing.	Plur.
Fac.	facite.	facito, facito.	facitote, faciunto.
Fer.	ferte.	ferto, ferto.	fertote, frunto.
Noli.	nolite.	nolito, nolito.	nolitote, nolunto.

IMPERFECT SUBJUNCTIVE PASSIVE.

Sing. Fierem, -es, -et.
Plur. Fieremus, -etis, -ent.
Sing. Ferrer, ferreris, ferretur.
Plur. Ferremur, ferremini, ferrentur.
'Nolo' has no passive voice.

4. Translate, parsing the words in italics:—

(*a*) Non semper beatus est qui longa vita *fruitur.*
(*b*) *Pepercisti victis* miseris *ignosce.*

TRANSLATION.

(*a*) He is not always a happy man who enjoys a long life.
(*b*) You have spared the conquered, pardon the wretched.

PARSING.

Fruitur—3rd pers., sing., subj. 'qui,' pres., indic., dep., 3rd conj. *fruor, fructus* or *fruitus, frui,* gov. abl. 'vita.'
Pepercisti—2nd pers., sing., subj. (tu), indic., perf. 3rd conj. *parco, peperci* or *parsi, parsum* or *parsitum, parcere,* gov. dat. 'victis.'
Victis—complete part. pass. dat. pl. verb, 3rd conj. *vinco, vici, victum, vincere.*
Ignosce—2nd pers., sing., subj. (tu), pres., imper., 3rd conj. *ignosco, -novi, -notum, -noscere,* gov. dat. 'miseris.'

5. Translate into Latin:—

(*a*) It is pleasant to have a friend.
(*b*) We ought not rashly to believe the words of the orator.

(*a*) Jucundum est amicum habere.
(*b*) Non temere credamus oratoris verbis oportet.

END OF THIRD YEAR.

FIRST PAPER.

(Two hours and a half allowed for this Paper.)

Dictation.

Write from dictation, in a neat hand, with correct spelling and punctuation, the passage read by the Inspector.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word 'Parenthetically.'

Write, in small hand, as a specimen of copy-setting, the sentence, 'In Saxon strength that Abbey frowned.'

Grammar.

'*Therefore* when the chiefs were removed, in order to go to the root, the whole *party was put* under a proscription so general and severe *as* to take their hard-earned bread from the lowest officers, in a manner which had never been known *before, even* in general revolutions.'

1. Analyse the above passage.

2. Parse the words in italics.

3. Point out the Latin prefixes in the passage, and give their exact force in each instance.

ANALYSIS.

SENTENCE	KIND	CONNECT.	SUBJECT	PREDICATE	OBJECT	EXTENSIONS
1. Therefore in order to go to the root the whole party was put under a proscription so general and severe as to take their hard-earned bread from the lowest officers in a manner	Principal		the whole party	was put under	a proscription so general and severe... manner	
2. when the chiefs were removed	subord. adv. to (1)	when	the chiefs	were removed		
3. which had never been known before even in general revolutions.	subord. adj. to 'manner' (3)	which	which	had been known		never (time) before (,,) even in general revolutions(place)

PARSING.

Therefore—adv. of consequence mod. 'was put.'
party—com. coll. noun, neut., sing., nom., subj. of 'was put.'
was—aux. verb of voice forming with past part.
put—intrans. verb, pass., indic., past, 3rd pers., sing., agr. with subj. 'party.'
as—abv. correl. with 'so,' forming part of the prep. phrase 'as to.'
before—adv. of time mod. 'had been known.'
even—adv. of deg. mod. the phrase 'in general revolutions.'

3. LATIN PREFIXES.

Prefix.	*Signification.*	*Word.*
re-	back	remove
pro-	for	proscription
re-	again	revolutions

Euclid.

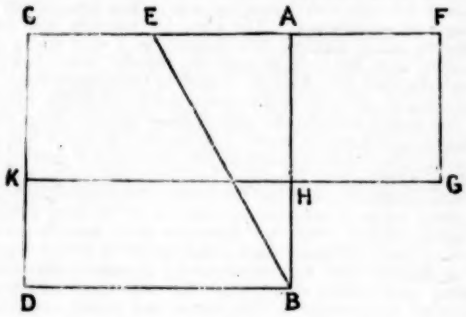
1. If one side of a triangle be produced, the exterior angle shall be greater than either of the interior opposite angles.

(Bk. I., Prop., 16.)

2. If a straight line be divided into any two parts, the squares on the whole line, and one of the parts, are equal to twice the rectangle contained by the whole and that part, together with the square on the other part.

(Bk. II., Prop. 7.)

3. To produce a given straight line so that the rectangle contained by the whole straight line thus produced, and the part produced, may be equal to the square on the given straight line.



Let AC be the given line. Bisect AC in E, upon CA describe the square CDBA. Join EB and produce CA to F making EF = EB. Then the rect. CF.FA is equal to the square on CA. Upon AF describe the square AFGH and produce GH to K.

Then because AC is bisected in E and produced to F, the rect. CF.FA together with the sq. on AE is equal to the sq. on EF, but EF = EB, ∴ rect. CF.FA together with the sq. on AE is equal to the sq. on EB. But sq. on EB = squares on BA and AE. Take away the common sq. on AE and the rect. CF.FA = sq. on AB, that is the sq. on CA the given line. ∴ The line CA has been produced to F so that the rect., &c.
Q. E. F.

Algebra and Mensuration.

1. Divide $10x^4 - 15y^4 - 48x^3y + 4xy^3 + 51x^2y^2$ by $4xy - 5x^2$

$$-5x^2+4xy+3y^2)\overline{10x^4-48x^3y+51x^2y^2+4xy^3-15y^4}\ (-2x^2+8xy-5y^2.\ \text{Ans.}$$
$$10x^4-\ 8x^3y-\ 6x^2y^2$$
$$-40x^3y+57x^2y^2+\ 4xy^3$$
$$-40x^3y-32x^2y^2+24xy^3$$
$$25x^2y^2-20xy^3-15y^4$$
$$25x^2y^2-20xy^3-15y^4$$

2. Solve the following equation:—

$$\tfrac{1}{4}[1+\tfrac{3}{8}(x+2)]-\tfrac{3}{4}[1\tfrac{1}{6}-(1\tfrac{1}{2}-x)]=1\tfrac{5}{16}.$$
$$\tfrac{1}{4}[1+\tfrac{3}{8}(x+2)]-\tfrac{3}{4}[1\tfrac{1}{3}-(1\tfrac{1}{2}-x)]=1\tfrac{5}{16}$$
$$\tfrac{1}{4}\left[1+\left(\frac{3x}{2}+3\right)\right]-\tfrac{3}{4}\left[\tfrac{4}{3}-\tfrac{5}{8}+x\right]=\tfrac{21}{16}$$
$$7\left(4+\frac{3x}{2}\right)-8\left(x-\tfrac{1}{8}\right)=31$$
$$28+\frac{21x}{2}-8x+\tfrac{8}{8}=31$$
$$168+63x-48x+8=186$$
$$15x=186-8-168$$
$$15x=10$$
$$x=\tfrac{2}{3}.\ \text{Ans.}$$

3. The diagonal of a square measures 8 feet 4 inches; find its area in square yards, feet, and inches.

area of square = $(50\text{ in.})^2 \times 2$
,, ,, = 5,000 sq. in.
,, ,, = 3 sq. yds. 7 sq. ft. 104 sq. in. Ans.

Arithmetic.

MALES.

1. A father left £1000 to be divided among his three children in proportion to their ages, which were 10, 25, 30 years, respectively. Find the share of each.

$10 + 25 + 30 = 65.$

		£	s.	d.
∴ the 1st gets $\frac{10}{65}$ of £1000	or	153	16	$11\frac{1}{13}$. Ans.
,, 2nd ,, $\frac{25}{65}$,, ,,	or	384	12	$3\frac{9}{13}$. Ans.
,, 3rd ,, $\frac{30}{65}$,, ,,	or	461	10	$9\frac{3}{13}$. Ans.

2. From Inverness to Forres is 27 miles. If A start from Inverness and B from Forres at the same time, and walk to meet each other, where will they meet, B being the better walker by 15 per cent.?

(*a*) B does 115 miles while A does 100.

(*b*) ∴ they do 215 miles together in the same time when walking to meet each other.

(*c*) They will therefore meet at $\frac{115}{215}$ of 27 miles from Forres, as B will cover the larger part of the way.

$$\frac{115}{215} \text{ of } 27 = \frac{27 \text{ mls.} \times 115}{215} = 14\frac{13}{43} \text{ miles from Forres. Ans.}$$

FEMALES.

1. Multiply ·1 by ·1 and express the result as a vulgar fraction.

$$\cdot 1 \times \cdot 1 = \tfrac{1}{9} \times \tfrac{1}{9} = \tfrac{1}{81}$$
$$= \cdot 012345679. \text{ Ans.}$$

2. Simplify $\frac{10{\cdot}01 - 8{\cdot}001}{6{\cdot}4 \div 4{\cdot}06}$ and express the result as a vulgar fraction.

$$\frac{10{\cdot}01 - 8{\cdot}001}{6{\cdot}4 \div 4{\cdot}06} = \frac{2{\cdot}009}{6\frac{4}{5} \div 4\frac{3}{50}}$$
$$= \frac{\frac{2009}{1000}}{\frac{32}{5} \times \frac{50}{203}}$$
$$= \frac{\frac{2009}{1000} \times \frac{5}{32} \times \frac{203}{50}}{}$$
$$= \frac{4074427}{1600000} \text{ or } 1\frac{2474427}{1600000}.$$

3. Find the value of 3·16 of 8s. 4d. + ·016 of £2 2s. 8d. + ·001 of £1 3s. 4d. − 1·3 of 1s.

	£	s.	d.
3·16 of 8s. 4d. = 100d. × 3·16 =	1	6	4
+ ·016 of £2 2s. 8d. = 512d. × $\frac{2}{125}$ =	0	0	$8\frac{24}{125}$
+ ·001 of £1 3s. 4d. = 280d. × $\frac{1}{1000}$ =	0	0	$0\frac{7}{25}$
	1	7	$0\frac{149}{125}$
− 1·3 of 1s. = 1s. × $1\frac{3}{10}$ =		1	4
	1	5	$8\frac{149}{125}$. Ans.

4. A man's income is £741 2s. 6d., and his daily expenditure is a guinea and a half; how much did he save in 1885, when he had to pay an income tax of 8d. in the £?

Total Income = ...	£741	2s.	6d.
365 days at £1 11s. 6d. =	£574	17s.	6d.
£741½ at 8d. per £ =	£24	14s.	1d.
	£599	11s.	7d.
Amount saved =	£141	10s.	11d. Ans.

SECOND PAPER.

(*Three hours allowed for this paper.*)

Geography.

1. Draw a map of Africa north of the equator, showing the rivers, and giving at least one degree of latitude and longitude.

2. Write short notes on the position and trade of the following places:—Port Said, The Congo, Sierra Leone, Cashmere, Smyrna, Singapore.

Port Said, a seaport of Egypt on the Mediterranean at the entrance to the Suez Canal, is the principal coaling station for steamers passing through the canal, and has a pier a mile and a half long.

The Congo, a great river of Central Africa, rises in the equatorial lake region and enters the Atlantic by an estuary six miles wide. The Congo region is said to be unrivalled as a field for colonization. At Punta de Lenha are numerous cotton-factories, the cloth being manufactured from the wild cotton, which grows in abundance, is of good quality, and easily separated from the seed. Great hopes are entertained that this river will become the great commercial route into the interior of Africa.

Sierra Leone is a West African colonial settlement belonging to Britain. When it became a British possession a hundred years ago a company was formed to make it a home for freed or refugee negroes. The climate is extremely unhealthy to Europeans.

Cashmere is a mountainous state in the north-west of India, having in the centre a small high-lying valley with a fine equable climate producing corn, wine, and silk, besides roses and other flowers innumerable.

Smyrna, on the west coast of Asia Minor, at the head of a deep inlet, is the last survivor of a number of seaports. A railway now proceeds from Smyrna inland as far as Alashehr, from which point the camel caravans start for the interior.

Singapore, on a small island at the extremity of the Malay peninsula, lying in the route from India to Australia as well as Eastern Asia, and hence the most important seat of marine commerce in Indo-China.

3. Show the effects of (*a*) the earth's rotation, and (*b*) the heat of the tropics, upon winds and ocean currents.

In order to obtain a clear notion of the nature and direction of winds it will be necessary to leave out of view the inequalities of the earth's surface. In tropical regions, where the vertical rays of the sun communicate a very great heat to the surface of the earth, the air in contact with this surface expands and rises through the higher stratum. Supported by this stratum it flows towards the nearest cold region, its place being meanwhile supplied by other currents proceeding from the adjacent cold regions. Hence we should expect that in the northern hemisphere winds *from* the north would prevail through the year, while in southern latitudes they would blow incessantly from the south. However, as the earth rotates on its axis from west to east every twenty-four hours its equatorial parts move at the rate of 1000 miles an hour while at the poles the surface remains at rest. Hence in passing from the higher latitudes towards the equator the cold currents of air arrive at regions of increased rotatory velocity. As they cannot keep pace with this increase of motion they necessarily lag behind and form currents flowing in a direction opposite to the rotation of the globe, or from *east* to *west*; and thus by the combined effects of the rotation of the globe and the difference of the temperature at its surface the northern and southern currents are deflected and modified so as to become respectively the permanent north-easterly and south-westerly *Trade Winds*.

Currents in the ocean depend upon the same causes as currents in the air. The waters within the tropics being greatly heated, evaporation to a considerable extent takes place. To supply the waste caused by evaporation, as well as to restore the equilibrium destroyed by the waters at the equator becoming heated, and therefore lighter, cold currents will flow from the north and south. Thus, as with winds, we might expect an equatorial current and return currents to the poles. The normal character of these currents must also be considerably modified by the distribution of land, though to a much greater extent than in the case of winds.

History.

1. Trace the fortunes of the House of Stuart from the Revolution of 1688 to the close of the Rebellion of 1745.

After being deposed (1688) James II. went over to Louis XIV., and in the following year by the help of a French fleet he invaded Ireland, to be finally defeated in the Battle of the Boyne, 1689. In 1692 a formidable attempt was made for the restoration of the Stuarts, but the fleet intended for the transport of the army was completely shattered off Cape La Hogue. When James II. died (1691) Louis acknowledged his son as king of Great Britain, and in 1708 great preparations were made by the French king at Dunkirk, but partly by dissension and partly by the vigilance of Admiral Byng the expedition was a failure.

On the death of Anne, who had been favourably disposed towards her half-brother, James, called the Old Pretender, declared his intention of claiming the throne, and accordingly his friends set up his standard at Braemar. The Pretender himself did not land in Scotland till after the battle of Sheriffmuir, and the surrender of Jacobite supporters at Preston. Landing at Peterhead he was met by the Earl of Mar, and he assumed the state of royalty. In a few weeks, however, he was compelled to leave the country, and embarked on board a French ship at Montrose. By the alliance between England and France James was forced to take refuge in Italy. He afterwards married Maria Clementina Sobieski, by whom he had two sons, Charles Edward, and Henry. During the latter part of his life he resided entirely at Rome, where he died, 1765.

Charles Edward, the Young Pretender, in 1743 attempted a fresh invasion, but the enterprise failed, and he withdrew to Paris till 1745, in which year he landed in the west of Scotland, and set up his standard at Glenfinnan, where he was joined by a number of Highland chieftains.

Eluding Sir John Cope he hurried towards Edinburgh, and on the way was joined by several nobles at Perth. Reaching Edinburgh he took up his residence in Holyrood Palace. Sir John Cope, having followed him, had drawn up his army at Prestonpans, and here the Highlanders surprised the Royalists and completely routed them.

In opposition to the advice of his council, Charles invaded England and reached Derby on his way to London. Forced to retreat, he returned to Scotland, and though successful in defeating General Hawley at Falkirk he continued his march northwards. At Culloden, 1746, he met the Royal forces under the Duke of Cumberland. His little army was utterly dispersed and he was forced to flee to the hills. After many romantic adventures he left Scotland never to return.

2. Give a short account of (*a*) the Act of Settlement, (*b*) the First Reform Bill, (*c*) the People's Charter.

The first Act of Settlement, 1689, settled the crown on William III. and Mary II. and their children, in default of which the crown was to go to Anne and her children. As William was childless and Anne's children all died young the second Act of Settlement, 1701, was passed, to secure a Protestant succession.

The First Reform Bill, 1832, redistributed the county franchise. Boroughs with less than 2,000 inhabitants were disfranchised, and no borough with less than 4,000 inhabitants could return two members. The franchise was given in boroughs and cities to all householders paying at least a yearly rent of £10, or, to vote for the county, of £50.

The 'People's Charter' was a document put forward in the beginning of the present reign by a set of men named Chartists, who demanded the following changes in the Constitution:—1. Universal suffrage. 2. Vote by ballot. 3. Annual Parliaments. 4. Payment of members of Parliament. 5. That every man should be eligible for a seat in Parliament. 6. That the country should be divided into electoral districts.

Composition.

Write a letter describing how you would begin a class in Geography, *or* on 'A house on fire.'

Glasgow,
28th April, 1888.

Sir,

In beginning a class in Geography my main object would be to gradually make them familiar with the meaning and use of maps, leading them to distinguish the various markings seen upon them. In order to do this I would present to them diagrams and models to illustrate geographical terms. For example, the model of an island might be shown, then a perspective representation of it, and finally a plan (or map) of it. If the same island can be pointed out on an ordinary map so much the better. Other islands should then be shown on the map, and their similarity commented upon. The definition of the term 'island' should then be got and put into a sentence to be committed to memory. In our school we have a very fine set of twelve pictures called 'Picturesque Geography,' which form a fine introduction to the meaning of river, sea, lake, island, &c. Drawing a plan of the school gives, perhaps, a clearer idea of a map than any other method; but I have seen the teacher, by covering a drawing-board with fine sand, illustrate the meaning of mountain, plateau, valley, plain, &c., in a very clear and interesting manner.

I am, Sir,
Your obedient servant,
MARY HUME.

H.M. Inspector, Esq.

School Management.

Draw up full notes of a lesson (specifying the age of the class for which it is intended) on *one* of the following subjects:—

(*a*) The complex sentence.

(*b*) The Trade Winds.

(*c*) Green (colour lesson for an infant class).

THE COMPLEX SENTENCE.

(*For Standard V.; age of pupils* 10—11.)

1. *Introduction.*—Recapitulation of lesson on simple sentence—subject—predicate—object—extension of predicate = adverb——distinction between *word*, *phrase* and *sentence* (*illustrate with copious exercises on black-board*).

2. *Second step.*—Sentences to be written on black-board as follows:—

(*a*) The teacher knew that the pupil could learn.

(*b*) The pupil that studies hard is sure to succeed.

(*c*) The teacher left when school was dismissed.

Draw from the class that (*a*) consists of two parts, an independent clause and a subordinate clause—the latter an object and equal to a noun, therefore a *noun clause*. Show that there are two predicates, and therefore two sentences, one depending on the other. In a similar manner let them see the adjective clause in (*b*), and the adverb clause in (*c*). (*Write, and ask for, similar sentences until the pupils are familiar with the form and composition of such sentences.*)

3. *Definition.*—A complex sentence consists of a principal clause (part, or sentence), and one or more subordinate clauses, which are of three kinds,—noun, adjective, or adverb clause.

4. *Analysis of Complex Sentence.*—Read over sentence—name the principal sentence—then the subordinate clauses telling whether noun, adjective, or adverb, with their relation to the principal sentence—and showing the connective. These sentences may also be analysed separately as simple sentences.

Latin.

THIRD STAGE.

(*Answers to be written on a separate paper.*)

1. Translate into English:—

(*a*) Dum ea conquiruntur et conferuntur, nocte intermissa circiter hominum millia VI. ejus pagi, qui Verbigenus appellatur sive timore *perterriti*, ne armis traditis supplicio adficerentur, sive spe salutis inducti, quod in tanta multitudine dediticiorum suam fugam aut occultari aut omnino ignorari posse existimarent, prima nocte e castris Helvetiorum *egressi* ad Rhenum finesque Germanorum contenderunt.

(*b*) Quod non fore *dicto* audientes neque signa laturi dicantur nihil se ea re commoveri: scire enim, quibuscumque exercitus dicto audiens non fuerit, aut male re *gesta* fortunam defuisse aut alique facinore comperto avaritiam esse convictam.

2. Parse fully the words in italics in the above passages.

TRANSLATION.

(*a*) While these things are being sought out and collected, night having intervened, about six thousand men of that canton which is called Verbigenus, either terrified by fear lest after their arms having been given up they should be visited with punishment, or induced, by the hope of safety, because they supposed that in so large a number of persons about to surrender their own flight could be either concealed or be altogether unknown, at the beginning of the night having gone forth from the camp of the Helvetii directed their course to the Rhine and the confines of the Germans.

(*b*) As to the soldiers being reported as not likely to obey the word of command, nor willing to carry forward the standards, that he was in no way disturbed by that circumstance, for he knew that those under whom an army would not be obedient to command, either fortune had deserted, on account of the unskilful conduct of some enterprise, or that in consequence of the discovery of some crime the charge of avarice had been fastened on them.

Parsing.

Perterriti—complete part., pass., nom., pl., mas., agr. with (homines) verb, 2nd conj. *perterreo, -ui, -itum, -ere.*

Egressi—complete part., nom., pl., mas., agr. with (homines) deponent verb, 3rd conj. *egredior, egressus, egredi.*

Dicto—dat., sing., neut., noun, 2nd decl. *dictum, -i,* gov. by *audientes* ('obeying').

3. Give a list of verbs and adjectives which govern the ablative case.

The adjectives governing the ablative are:—dignus, indignus, contentus, captus, fretus; also natus, satus, ortus, editus, and the like.

The verbs are utor, abutor, fruor, fungor, potior and vescor diquor, glorior, liberare nitor, nascor, creor, afficio, consto, and some others.

4. Translate into Latin:—

(*a*) When a great number of the soldiers had perished the rest laid down their arms.

(*b*) In almost all regions of the earth we have carried on war by sea and land.

(*c*) The citizens did not dare to enter the temple, for this was forbidden by the laws.

(*a*) Quum magnus militum numerus interiisset, reliqui arma sua posuerunt.

(*b*) In omnibus fere regionibus orbis, bellum terra marique gessimus.

(*c*) Cives inire in templum non ausi sunt quod hoc a legibus vetitum est.

(To be continued.)

—o—

How my School was Examined.

BY THE

HEAD MASTER OF A BOYS' SCHOOL.

STANDARD I.

Arithmetic.—The boys being divided alternately into sets *A* and *B*, the following sets of sums were dictated.

A. 1 694 + 307 + 980 + 46 + 798.
2 411 − 12.
3 600 − 591.

B. 1 768 + 437 + 15 + 909 + 67.
2 905 − 176.
3 896 − 203.

Answers.—*A.* (1) 2825; (2) 399; (3) 9. *B.* (1) 2196; (2) 729; (3) 693.

Dictation of words:—*Small, Finger, Branch, Table, Needle, Eyes, Cheese, Mother, Goose, Money.*

STANDARD II.

Arithmetic examined by means of following sums:—

A. 1 10,670 − 990.
2 86,010 ÷ 6.
3 17,011 ÷ 5.
4 69,089 × 970.

B. 1 6,901 − 1,087.
2 63,794 ÷ 8.
3 4,896 × 750.
4 68,375 × 68.

Answers.—*A.* (1) 9,680; (2) 14,335; (3) 3,402 + 1 over; (4) 67,016,330.

B. (1) 5,814; (2) 7,974 + 2; (3) 3,672,000; (4) 4,649,500.

Dictation.—'Just as they reached the worst part of the mountain one of them fell, and in falling he knocked down the person in front of him. The rope by which they were all bound together broke and four of the travellers when last seen by their friends were sliding downwards.'

Grammar.—The boys were required to make sentences with proper names; also to change nouns into pronouns. They were asked for gender, number, and person.

Geography.—The following are specimens of the questions asked.

What is a delta? How is a delta formed? Why is it called delta? (From the Greek letter *delta* Δ or D.)

When a river has not an island at its mouth, what is the mouth called? Mention any river that has an *estuary.*

When the tide meets the stream and causes the water to rise what is that called? (*Bore.*)

How do we know that the earth is round?

What is meant by the sea-beach?

What is the hollow called which a river makes for itself?

How do you know the right bank of a river?

What do you call the place where a tributary meets the river?

STANDARD III.

Arithmetic.—Specimen cards:—

A. 1. £16 0s. 1½d. + £900 17s. 0d. + £675 8s. 9¾d. and twenty-five guineas.

2. Find the difference between 3,006 farthings and 42,019 farthings, and write the answer in £ s. d.

3. Divide half a million by 19 times 194.

4. What would it cost to give 60 children each an apple, a pear, and a bun, if the apple cost a farthing, the pear a half-penny, and the bun a penny?

B. 1. £3,275 14s. 4d. + £7,006 12s. 0¾d. + 18s. 10½d. + £2,415 10s. 11d. + 9½d.

2. From £1,417 17s. 4¼d. take £14 17s. 0½d.

3. Divide 91,400 by 98.

4. I am paid four sums of 15s. 8d., 8s. 4d., 7s. 11d., and 1d. I divide the money equally among my four children. How much does each get?

Answers:—*A.* (1) £1,618 10s. 11¼d. (2) £40 12s. 9¼d. (3) 135 + $\frac{2390}{3686}$. (4) 8s. 9d.

B. (1) £12,698 16s. 11¾d. (2) £1,403 0s. 3¾d. (3) 93² + $\frac{64}{98}$. (4) 8s.

Dictation.—The following passage was given:—

'The queen was very sorry for her favourite, and if he had asked for mercy she would readily have granted it. She daily and hourly looked for him to send the ring, but the ring never came. The queen thought him proud and stubborn, and she became the same.'

Grammar.—The Inspector took all the parts of speech in this Standard, and was very particular with sentence-making. He required adverbs to be used in different ways, and questioned on the inflexions of nouns and pronouns.

Geography.—The boys were closely questioned on the district in which they lived, on the manufactures of England, on the exports and imports, on the chief towns and seaports, and on their trades. Questions were also asked on the basins of the Severn, Trent, and Thames, the Black Country, Glamorganshire, the Fen District, and Hampshire, and especially on places of historical interest and places noted for their scenery.

STANDARD IV.

Arithmetic.—A. 1. Multiply £6 16s. 4¼d. by 209.
2. Divide £3,689 3s. 1¾d. by 47.
3. Reduce 2 cwts. 0 qr. 15 lbs. to quarter ounces.
4. If a penny is 3 inches in circumference, how many times will it have rolled round along a path 1 pole 5 yds. long?

B. 1. Reduce 50,050 half-pence to pounds, shillings, and pence.
2. Multiply £439 6s. 9¾d. by 142.
3. How many ounces in 6 cwt. 2 qrs. 4 lbs.?
4. If a pigeon flies 54 miles an hour, how many yards will it fly in 3½ hours?

C. 1. £8,700 0s. 7¼d. ÷ 29.
2. £489 11s. 7¾d. × 597.
3. How many half-pints in 54 gallons 1 quart 1 pint?
4. If a wall is 320 feet long and 11½ feet high, find the surface.

Answers.—*A.* (1) £1,424 18s. 0¼d. (2) £78 9s. 10¼d. (3) 15296 qr. ozs. (4) 126 times.
B. (1) £104 5s. 5d. (2) £62,386 7s. 4½d. (3) 11,712 ozs. (4) 45,440 yds.
C. (1) £300 0s. 0¼d. (2) £292,280 12s. 6¾d. (3) 870. (4) 408 sq. yds. 8 sq. ft.

Dictation.—'The youth was summoned, and informed that his plans had been accepted, and that the prize was his. The gentleman then said that he must put up the building; and his employer was so pleased with his success that he willingly gave him permission to go. The studious, painstaking carpenter became a great architect. He made a fortune, and rose high in public estimation.

STANDARD V.

Arithmetical cards were given containing the following among other questions:—
1. Find the value of 206 tons 7 cwt. at £3 4s. 7d. per ton.
2. Work the following $\frac{2}{5} + \frac{2}{3} - \frac{3}{4}$.
3. If a fourpenny loaf weighs 3 lbs. when wheat is 24s. per quarter, how much would it weigh when wheat is 30s. per quarter?
4. Find the cost of 1,001 chairs at 19s. 7½d. each.
5. What must be added to $\frac{1}{2} + \frac{1}{5} + \frac{1}{8}$ to make 1?

Answers.—(1) £666 6s. 9¼d. (2) $\frac{19}{60}$. (3) 2 lbs. 6⅔ ozs. (4) £982 4s. 7½d. (5) $\frac{2}{15}$.

As an exercise in *composition* the boys were required to reproduce a short story which was told them twice by the Inspector.

Standards IV. and V. had the same sentences for grammatical exercises, parsing and analysis.

A. In August he always leaves England for warmer countries.

B. The soldier took a last fond look at the village church.

C. You yet may spy the fawn at play.

Geography was tested in these standards by questions on places of historical interest in Ireland, on the physical features of Australia and New Zealand, and interchange of production. Maps were drawn from memory.

STANDARD VI.

Arithmetic. A card:

1. If 63 lengths, each 1⅝ inches long, are taken from 10 feet, how much is left?
2. If a man travels 66 ft. in a second, how long will it take him to travel 402 miles at the same rate?
3. Simplify (61·0089 + 17·001926 — ·018) × ·5.
4. If 1d. gains 1½d. interest in 6 months, what is the gain per cent. per annum?

Answers.—(1) 3 ft. 7 in. (2) 8 hrs. 56 min. (3) 38·996413. (4) 300 per cent.

STANDARD VII.

Arithmetic.—A card:

1. A person who had spent ⅝ of his money at one shop, and ⅓ of the remainder at another, found he had £57 12s. left. How much had he at first?
2. Sound travels at the rate of 1,142 feet in a second. How far ought it to go in 5¾ seconds?
3. A man sells corn for £17 and loses 15 per cent. How much must he sell it for so as to gain 15 per cent.?
4. What is the average daily takings for six days on which £15 10s., £39 15s., £20, £17 9s. £15 17s. 2d., and £43 16s. are taken respectively?

Answers.—(1) £691 4s. (2) 1 m. 1 fur. 37 pls. 5 yds. 1 ft. (3) £23. (4) £25 7s. 10⅓d.

Composition for Standards VI. and VII.
Write an Essay on—
A. Boating, or
B. A Fisherman's Life, or
C. An application for a situation.

Grammar for the same Standards was tested by analysis and parsing of the following sentences:—
A. I stooped and wrote upon the sand my name.
B. See that your letters are properly formed and lean one way.
C. Every substance through which light passes bends it more or less.

In all the upper Standards oral questioning was also given on word-building; for example, make other words from *actor, consider, arrange, conceive, sense, boy,* &c.

The upper Standards were questioned collectively on *Geography*, and maps were drawn from memory.

—o—

Practical Needlework in Elementary Schools.

BY MISS J. W. WARREN,

Inspectress of Needlework to the Leicester School Board.

IT is no easy task in these days to write on practical needlework. It is not a new subject; on the contrary, it is as old and time-honoured as any with which we are familiar, and the difficulty lies just in this fact—

nearly every woman will ridicule the idea that you can teach her more than she knows on such a generally accepted well-known theme. Now I venture at the onset to suggest that my articles are for those who do not know rather than the class referred to above. I will, therefore, without further preamble, address myself to teachers who, by reason of distance from educational centres, are willing to avail themselves of the excellent medium the PRACTICAL TEACHER affords.

My plan will be to write out a scheme workable from the babies' room through the whole school course, giving from time to time, where necessary, sheets of patterns, stitches and drills, and also advice as to suitable materials, apparatus, &c. The patterns will be in anticipation of a future rather than in consideration of a past, and in all cases taken direct from a garment, the worth of which has been proved. I shall keep close to Schedule III. and endeavour to give clear definite instruction by the way.

No mere theorist will ever be a good practical teacher of needlework. No amount of reading will make her a skilful needlewoman. Practice and nothing else in the world will bring about the desired result. Therefore, I say to one and every young teacher, try every specimen yourself before you attempt to teach it, do not deceive yourself with its apparent simplicity, believe me no ignorance is more fatal than that which excuses itself in this way. Even the elementary drills that accompany this month's issue should be gone through time after time, and the words committed to memory ere you bring them before your pupils. To put immature plans into execution is to insult child nature. And as I write on tried methods I confidently promise success in every case where practice accompanies the lessons.

Remember that needlework is a domestic *art*, and as such must have more time devoted to its practice than a mere intellectual lesson. Instruction should directly be followed or rather accompanied by doing, not even letting one day elapse. Test for yourself the advantages of the methods and materials suggested before you veto them, take a little trouble to get all things suitable for the teaching of so useful a subject. Remember that high, low, rich and poor alike agree that this at least is a necessary and useful part of a girl's education. All sympathy is with you and success is inevitable. If you will only be content to creep first and walk next, you shall in the end run. With these few opening remarks I proceed to the actual work of Schedule III.

'*Below Standard I.= Infant Schools.—Needle drill; position drill; strips 18 in. by 2 in. in simple hemming, with coloured cottons, in the following order: 1st, black; 2nd, red; 3rd, blue.*'

This is the work of the Infants' Department; it is certainly within the compass of every child born with a fair share of sense, but it is quite possible, and constantly proved, that children pass up to the girls' departments without even a fragment of this necessary preparation.

First begin with your babies. Make them by pleasant and suitable occupation quite *ready* to thread a needle and put on a thimble; no more, no less. Less is neglect, more, though possible, is dangerous and unsuitable.

Let them have beads, baby-threaders, and thimbles. These simple gifts will do all you want, and when they emerge from the baby-room you can, in a couple of months, teach three other drills, combined thread and thimble, position, and stitch drills.

Plan.—Buy a ball of coloured twine. Cut it into half-yard lengths, one for each child. Fasten at one end an ordinary shoe button. Provide also some large wooden beads of simple colours, I have used those from the number frame when it has been broken. Any kindergarten depôt will supply them; provide also per child a tin saucer, cost one halfpenny. Let each child have one or more beads in his saucer, and one piece of string. A quarter of an hour each day may be given, without fear of monotony, to this threading. See 'Bead-drill.'

These threading lessons admit of infinite variety by change of materials, stories, rhymes, &c., but to enter more fully into details would be to write on kindergarten rather than needlework. The youngest and newly admitted babies may join this drill, the beads are too large to get down their throats, or up their noses, or in their ears—hence their great value as a start. See Bead-drill, Sheet I.

Baby threaders are needles about three inches long devoid of points, about as thick as a 12 Bell gauge knitting pin, corresponding large eye—cost retail four pence a hundred. An excellent substitute is an ordinary tape needle, with the useful addition of two eyes, the twine as in bead drill, but with the added difficulty of two free ends. The babies may be put through the threader drill very soon after beginning the beads, indeed where difficulty is found in procuring the beads they might be substituted by threaders. See threader drill, Sheet I.

Though not mentioned in the schedule it is the custom in Infants' Schools to use a thimble drill. In the babies' room it makes a very useful variety, and is exceedingly popular because it admits of some noise which if rythmic is both pleasing and instructive.

Be careful in your selection of thimbles. Let them be of white metal 'Silver washed' as it is called. Fit up your little ones, take time and trouble with this, remember that to hurry education is at all stages ridiculous, but it is more absurd in a class of babies than elsewhere. While fitting chat constantly. Sometimes let the children fit themselves. I have seen girls content with a thimble too tight or too loose but never in schools remarkable for the excellence of their work; it is the direct outcome of a slovenly or irritable teacher. See thimble drill, Sheet I.

I think the babies' room may now be safely left. I am aware that this I suggest is very little, that work has been and continues to be done by these mites of humanity, but to put so exceedingly dangerous an instrument as a needle into the little untried hand is to enact a discipline that in itself is detrimental and wholly opposed to the principles of an enlightened experience. I prefer therefore to leave these feats of daring to those who have little or no knowledge of education, a very little soundly taught will produce results that may surprise even the one who imparts it. Next month I deal with the actual teaching of a stitch and the accompanying necessary sheet of drills.

SHEET I.

BEAD, THREADER, AND THIMBLE DRILLS.

BEAD THREADING DRILL.	BABY THREADER DRILL.	THIMBLE DRILL.
1. Pick up the thread (right hand).	1. Pick up thread (right hand).	1. Show right hand, spread fingers.
2. Point it nicely (left hand).	2. Sharpen point (left hand).	2. With thumb hold 1, 3, 4 fingers down.
3. Pick up a bead (left hand).	3. Pick threader up (left hand).	3. Pick thimble up (left hand).
4. Put hands together, rest 3rd and 4th fingers of right on knuckles of left.	4. Put hands together, 3rd and 4th fingers of right on knuckles of left.	4. Put thimble on finger.
5. Thread string through bead and hold bead with right hand.	5. Slip thread through eye and hold needle with left hand.	5. Hold it up to be seen.
6. Catch hold of short end with left hand.	6. Catch short end of thread in left hand.	6. Put both hands down or away.
NOTE.—Every teacher will know how to more clearly define these operations at first so that at last the mere number will suggest the part to be done. In threading No. 5, the bead is to be held quite still, the right hand being steadier guides the twine through.	NOTE.—The teacher must play with needle at end of drill, and on no account pick up needle first, beginners are very apt to do this if not taught a good method.	NOTE.—Talks on which finger, and tests of accuracy may be taken throughout, with songs, introducing tapping, jingling, drumming, &c.

No drill, however good, should continue for more than ten or fifteen minutes.

Model Essays for Pupil Teachers.

BY C. J. DAWSON, B.A.,
Ex-President of the N.U.E.T.

IV.

THERE is one kind of essay in which pupil teachers and other students would do well to exercise themselves if they would attain facility in composition and all the advantage which the practice of it may bring them; it is the essay based on poetical ideas. Some subjects lend themselves very readily to this kind of treatment; among such may be named the Coming of Spring, the Blessing of Hope, Ideal Characters, Teachings of Legends and Fairy Tales.

An important element in essays of this class is the quotation of opinions of other writers, or of passages poetical or otherwise which serve to illustrate the subject and the essayist's views. There is an art in the use of quotations, and some of our eminent prose writers have distinguished themselves by the wonderfully apt manner in which they have introduced the words of their predecessors. Ease and skill in doing this demand of course that the writer shall have his mind well-stored with passages bearing on his subject and suitable for quotation. Where the conditions under which he writes admit of it, he should endeavour always to verify his quotations; but if, as in an examination, he is writing without access to books, he must rely on his memory; and it will be wise for him to give no quotation as exact unless he is quite sure of its being so.

In these papers, however, we have in view not only the student's task of writing a brief essay under stringent conditions of time, space, and entire self-dependence; but also that careful and persistent practice of writing without which readiness and skill cannot well be hoped for. It is for this reason that we have not confined our specimen essays to the meagre dimensions of those which can be produced in the few minutes a pupil teacher can devote to an essay, when the whole time available for a paper on several subjects is only two or three hours.

We would recommend that every pupil teacher and every student of English should make it a regular part of his course of study to write once a month, if not oftener, a careful essay on some subject such as he may have to deal with in his examinations or in the fulfilment of his duties.

We hope on some future occasion to give some examples of the very short essays which may be written in the examination time allowed to pupil teachers or to children in the higher standards. We propose to make the model essay of this month illustrative of our remarks on the use of quotation in dealing with the poetical aspect of a subject, and the subject we select is—

THE INFLUENCE OF MUSIC.

In all ages and among all peoples of whom we have detailed knowledge the influence of music seems to have been generally felt and recognised. In proof of this we may refer to scripture, to mythology, to history, fable, legend and poetry, and also to our own individual experience.

In scripture we have a noteworthy instance of the powerful effect of music in the case of David's playing before Saul when the latter was attacked by his fits of madness. In the mythological fables of the Sirens and of Orpheus we have the influence of music treated hyperbolically as affecting not merely the minds of men, but the actions of beasts, and even having marvellous effect on inanimate nature. In the words of the famous Shakespearean song—

> 'Orpheus, with his lute, made trees,
> And the mountain-tops which freeze,
> Bow themselves, when he did sing.'

And in the parallel passage, so often mis-quoted, from Congreve's 'Mourning Bride,' the same idea is expressed—

> 'Music has charms to soothe a savage breast,
> To soften rocks, or bend a knotted oak.'

In our early history we have read how the harping of King Alfred beguiled the Danes into negligence of their watch, and we have all heard memorable anecdotes of the influence of a pipe or a violin in charming wolves and other savage creatures into temporary harmlessness. The legend of the 'Pied Piper of Hamelin,' so wonderfully cast into verse by Robert Browning, will recur to the mind of every reader.

The poets seem never weary of dwelling on the enchantment that is wrought by music. The last lines of Shakespeare's song already quoted tell us

> 'In sweet music is such art,—
> Killing care and grief of heart
> Fall asleep, or, hearing, die.'

And Tennyson speaks of

> 'Music, which gentlier on the spirit lies,
> Than tired eyelids upon tired eyes.'

Luther is recorded to have said 'Music is the art of the prophets, the only art that can *calm* the agitations of the soul.'

This soothing effect of music seems to be the favourite one with poets: but music does not only soothe. It also rouses and inspires. The soul may be not only 'lapped in soft Lydian airs,' but animated by trumpet blasts to deeds of heroic courage and patriotism. How often have the lays of the bards and minstrels with their wild snatches of song and thrilling accompaniments on the harp moved our Celtic forerunners to fight for their home! and how in later times have such strains as the March of the Men of Harlech, or the Marseillaise, or the Watch on the Rhine, or the pibroch of the Scotch, stirred men's hearts to fight madly for the cause which they severally symbolised!

In the chase and in the dance music plays an important part. To the latter indeed it may be considered indispensable, while its connection with the former is marked not only by the rousing horn but by such rare old songs as 'John Peel' and 'Old Towler.'

Again, the sublime strains of our modern sacred music seem to call forth and give expression to the highest forms of reverential worship. Who that has any ear or taste can listen to such music as Handel's Hallelujah Chorus, or Haydn's 'The Heavens are Telling,' or Mendelssohn's 'Thanks be to God,' and not feel lifted up in awe and adoration? Great Handel said that while composing the Hallelujah, it seemed to him as if 'he saw all heaven open before him, and the Great God himself!'

Indeed the inexhaustible combinations of melody, rhythm, and harmony, of force, speed, and expression,

are capable of rendering every emotion of the soul, and so give rise to a correspondingly infinite variety of influence produced thereby.

It would be difficult to analyse the nature of this mysterious influence which is exercised by music. Carlyle says 'The meaning of song goes deep. Who is there that, in logical words, can express the effect music has on us? A kind of inarticulate, unfathomable speech, which leads us on to the edge of the infinite, and lets us for moments gaze into that!'

It may be that the law of order which lies at the root of all music and runs through every variety of it has much to do with its influence. It has at all events been distinctly recognised as an essential element in music that it should be based on law, and this has led to a sort of identification of orderly and harmonious movement with music. Hence the phrase 'Music of the spheres' and Shakespeare's lines

> 'There's not the smallest orb which thou behold'st,
> But in his motion like an angel sings,
> Still quiring to the young-eyed cherubims.'

Doubtless too there is a natural correspondence between sounds and our feelings, or, as Cowper puts it in his 'Winter Walk at Noon,'—

> 'There is in souls a sympathy with sounds,
> And as the mind is pitched the ear is pleased
> With melting airs or martial, brisk or grave.
> Some chord in unison with what we hear
> Is touched within us, and the heart replies.'

Another noteworthy feature in music is the persistency with which associations cling to particular tunes. Music has been spoken of as evanescent in its nature, but nothing is more apt to awaken memories of the scenes of far away, the events of long ago, than some song or tune that has made some strong impression upon us,—not even a painting which may almost realise a scene to the sight, or a description which laboriously depicts it for the understanding. What thoughts crowd on the mind of the Switzer or the Savoyard as he hears in a distant land one of his native Alpine songs! What recollections are brought to the mind of a Scot as he listens to the strains of 'Auld Lang Syne' or 'Scots wha hae,' or to a son of Erin by such melodies as 'The Minstrel Boy,' or 'The Harp that once through Tara's Halls!'

And how closely favourite tunes will cling to us, to cheer and help us on our way! Keble, in his 'Christian Year,' has a beautiful stanza embodying this thought.

> 'There are in this loud stunning tide
> Of human care and crime,
> With whom the melodies abide
> Of th' everlasting chime;
> Who carry music in their heart
> Through dusky lane and wrangling mart,
> Plying their daily task with busier feet,
> Because their secret souls a holy strain repeat.'

Rogers also refers to this clinging of music when, in his poem on Ginevra, he says of her picture—

> 'It haunts me still like some wild melody.'

And Coleridge in his Hymn to Mont Blanc, says

> 'Yet, like some sweet beguiling melody,
> So sweet we know not we are listening to it,
> Thou, the meanwhile, wast blending with my thought.'

We must not, however, proceed further in the task of attempting to analyse the power of music. It is, as we have said, difficult, perhaps impossible. But the character of that influence deserves a moment's consideration. Shakespeare puts into the mouth of Lorenzo the words,—

> 'The man that hath no music in himself,
> Nor is not moved by concord of sweet sounds,
> Is fit for treasons, stratagems, and spoils.'

But we must not suppose that music has no power except for good. It has been associated with dreadful deeds and degrading pleasures as well as high thoughts and noble enterprises: witness the tradition of Nero's fiddling during the burning of Rome.

What we should endeavour to do so far as our own influence may reach is to cultivate in ourselves and those about us a taste for the best music. The lofty strains of the great classical composers, our national songs, and such tasteful, pleasing music as Sir Arthur Sullivan and many living musicians have made popular can do no possible harm, but on the contrary are likely to have a refining and elevating tendency. They will afford healthy recreation and enable all who come under their influence to live happier and therefore more useful lives.

(To be continued.)

Query Column.

RULES.

1. Each correspondent is restricted to *one question*. We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—*'The Query Editor,' The Practical Teacher, Pilgrim Street, Ludgate Hill, London, E.C.*

General.

1. A. H. H.—You should see who are the examiners and use their books among others if they have published works upon the subject. Bower and Vine's book is certainly excellent. Chara might certainly be expected; not the others you name. All necessary re-agents are provided.

2. AGRI.—You say you want 'Name of examiner in agriculture' and best text book for purpose of examination. Explain what examination you refer to and we will answer your query.

3. VIA.—It is intended that it should be, and most likely it will; else it would be practically useless.

4. A. S.—Phillip's Atlas contains maps of the British Empire. So does Johnston's. Both are very good. We think the book is about 4s. 6d. but you really don't need it. You need not write to publishers. A bookseller's collector knows where to go quite well. Longman is the publisher in the case you mention.

5. W. B.—Longman and Co. publish the essays. Your bookseller ought to be able to get them without any assistance. His agents must know quite well where to go. Have you two booksellers, try the other.

6. NAPIER.—(1) There is no man that fears you less than he fears you.

(2) There is no man that fears you less than he fears him.

(3) There is no man that I fear more than he does.

(4) There is no man that I fear more than I fear him.

7. PIERRE.—A good edition of Derrière les Haies is published by Hachette and Co., possibly of the other too. Both would be well annotated. We know of no editions with vocabularies. All Racine's works are translated and published by Bohn. You will hardly need translations.

8. J. H.—Ask exactly what you want to know and we will answer you. Your question is too general. Meantime get Hewett's Mother tongue, Lock's School Arithmetic, Todhunter's or C. Smith's Algebra (larger volumes), Langton's School Management. Dunstan's Manual of Music.

9. RECONNAISSANT.—Yes we think it would under good direction. You would not be likely to be able to do it for yourself. Such things can be done but time is always wasted and the best results rarely obtained.

10. SCOTCH.—Large hand. Froms of the letters not good, down strokes are too heavy, curves are not graceful. You bear too heavily upon the pen, 60. Small hand. The ink and pen seem to have been bad. The general forms of the letters need improvement. Steady practice of a good model for a few minutes a day for three months would no doubt produce a great change, 70.

11. LEON.—You should never assume you have passed till the fact is announced. You have done right to enquire at the office, if they won't tell you we cannot. It might be as well to wait another year. Your English Composition needs very great care. Be particular with the punctuation. Your note to us is very faulty in that matter. Thank you for your kind opinion. Bring the magazine under the notice of your friends.

12. W. SULSTON.—All students, unless prevented by illness, take the first year's papers at the end of the first year, and if they pass they are then allowed to take second year's papers at the end of the second year. If you did not pass in some of the first year's papers you would not be able to take some of the higher subjects in the second year. You cannot do as you like in the matter. You may assume that you must take the first year's papers at the end of the first year, and the second year's papers at the end of the second year.

13. DENTON.—Large hand 65, small hand 70. The writing is not above fair. The large hand letters are stiff, badly formed, and improperly joined. The letters m, n, e, s of the small hand are the worst. You are not restricted to one set of books. Imitate a good model and send another specimen. We should recommend Cowham's Mulhauser series. If you prefer Vere Foster's, use them.

14. ADMIRER.—No; if you say 80 you won't be right, but you won't be far wrong.

15. FABIOLA.—Twisden's 'Theoretical Mechanics,' Deschanel's 'Light, Sound, and Heat,' or 'Light and Sound,' and Garnett's 'Heat.' Mother tongue is native tongue. For us it is English; for a Frenchman it is French. You are not right; it is not the baby language which a child first picks up.

16. SIOPWR MAWR.—(*a.*) For July. (*b.*) You must send the question. (*c.*) Most likely in June.

17. JOSEPH BELL.—From micrometrical measures of the lengths of the shadows of the most conspicuous of the mountains of the moon, taken under the most favourable circumstances, the heights of many of them have been calculated.

18. L. R. W.—If $2a'$, $2a''$ be the inclination of two radii of a circle $x^2 + z^2 = r^2$ to the axis of x, find the equation to the chord joining the extremities of the radii. (*Puckle.*)

Let x_1, z_1 be the co-ordinates of the extremity of one of the radii,

And let x_2, z_2 be the co-ordinates of the extremity of the other radius;

Then, $x_1 = r\cos 2a'$, $z_1 = r\sin 2a'$;

$x_2 = r\cos 2a''$, $z_2 = r\sin 2a''$.

Equation to the straight line passing through the points x_1, z_1 and x_2, z_2 is:—

$$(z - z_1)(x_2 - x_1) = (x - x_1)(z_2 - z_1);$$

$\therefore$ Equation to the line is:—

$$(z - r\sin 2a')(r\cos 2a'' - r\cos 2a') = (x - r\cos 2a')(r\sin 2a'' - r\sin 2a')$$

$$z(\cos 2a'' - \cos 2a') - r\sin 2a'(\cos 2a'' - \cos 2a') = x(\sin 2a'' - \sin 2a') - r\cos 2a'(\sin 2a'' - \sin 2a') \quad \therefore$$

$$x(\sin 2a' - \sin 2a'') + z(\cos 2a'' - \cos 2a') = r(\sin 2a'\cos 2a'' - \sin 2a''\cos 2a')$$

$$2x\sin(a' - a'')\cos(a' + a'') + 2z\sin(a' - a'')\sin(a' + a'') = r\sin(2a' - 2a'') = 2r\sin(a' - a'')(\cos a' - a'')$$

Dividing by $2\sin(a' - a'')$]

$$x\cos(a' + a'') + z\sin(a' + a'') = r\cos(a' - a'') = r\cos(a'' - a').$$

Arithmetic.

1. FOLKESTONIAN.—The successful candidate at an election polled $\frac{8}{9}$ of the voters, and had a majority of 756 over his rival, $\frac{1}{9}$ of the constituency remaining unpolled. Required the number that voted for each candidate, and gross number of electors.

Number for successful candidate = $\frac{8}{9}$ of electors,

" unsuccessful " = $(\frac{8}{9} - \frac{3}{5})$ of electors

$$= \frac{40 - 27}{45} \text{ "}$$

$$= \frac{13}{45} \text{ " ;}$$

$\therefore$ Difference = $(\frac{8}{9} - \frac{13}{45})$ of electors

$$= \frac{27 - 13}{45} \text{ "}$$

$$= \frac{14}{45} \text{ " ;}$$

$\therefore \frac{14}{45}$ of electors = 756,

$$\therefore \text{Number of electors} = 756 \times \frac{45}{14}$$

$$= 2{,}430.$$

Number for successful candidate = $\frac{8}{9}$ of 2,430

$$= 486 \times 3$$

$$= 1{,}458;$$

" unsuccessful " = $1{,}458 - 756$

$$= \underline{702}.$$

2. RHONDDA.—A vessel is full of a mixture of a spirit and water, in which there is found to be 17 per cent. by measure of spirit. Ten gallons are drawn off, and the vessel is filled up with water. The proportion of spirit is now found to be $15\frac{3}{5}$ per cent. How much does the vessel hold?

Quantity of spirit drawn off = 17 % of 10 gals.

$$= \tfrac{17}{100} \text{ of } 10 \text{ gals.}$$

$$= \tfrac{17}{10} \text{ gals.;}$$

$\therefore (17\% - 15\tfrac{3}{5}\%)$ of contents = $\frac{17}{10}$ gals.,

$1\frac{2}{5}$ % of contents = $\frac{17}{10}$ gals.,

$\frac{14}{100}$ of contents = $\frac{17}{10}$ gals.

$$\therefore \text{Contents} = \left(\frac{17}{10} \times \frac{900}{17}\right) \text{ gals.}$$

$$= \underline{90 \text{ gals.}} \text{ Ans.}$$

3. NITOR.—A vat contains 900 gallons of methylated spirits to which 9 % too little naphtha has been added; how much naphtha must be added to bring the mixture to the legal standard, which is 10 % of naphtha?

Quantity of naphtha at first = 1 % of 900 gals.
= 9 gals.;
∴ Quantity to be added + 9 gals.
= 10 % (900 gals. + Quantity to be added)
= $\frac{1}{10}$ (900 gals. + Quantity)
= 90 gals. + $\frac{1}{10}$ Quantity,
Quantity − $\frac{1}{10}$ Quantity = 90 gals. − 9 gals.
$\frac{9}{10}$ Quantity = 81 gals.,
∴ Quantity = 81 gals. × $\frac{10}{9}$
= <u>90 gals.</u> Ans.

Or—

gals. gals. gals.
(100 − 10) : (900 − 9) :: 10 : Total quantity of naphtha.

gals. gals. gals.
90 : 891 :: 10 : Total quantity.
99
= 99 gals.

∴ Quantity of naphtha to be added
= 99 gals. − 9 gals.
= <u>90 gals.</u> Ans.

4. LEARNER.—Find the G.C.M. of 3,116,295 and 9,883,705 only once dividing. *(Marlborough Arithmetic.)*

3116295)9883705(3
9348885
534820

The G.C.M. of the two numbers will measure their sum.
3,116,295 + 9,883,705
= 13,000,000;
And 13 will measure 534,820; and 5 is the only measure in addition common to the two numbers and their sum;
∴ G.C.M. = 13 × 5
= <u>65.</u> Ans.

Algebra.

1. UDGORN.—Solve:—

$$\left.\begin{aligned}(b+c)(x+c-b)+a(y+a)&=2a^2\\ \frac{ay}{(b-c)x}&=\frac{(b+c)^2}{a^2}\end{aligned}\right\}$$

(Hamblin Smith.)

$$\left.\begin{aligned}&(1)\quad (b+c)(x+c-b)+a(y+a)=2a^2\\ &(2)\quad \frac{ay}{(b-c)x}=\frac{(b+c)^2}{a^2}\end{aligned}\right\}$$

(1) $(b+c)x+(b+c)(c-b)+ay+a^2=2a^2$
$(b+c)x-(b+c)(b-c)+ay=a^2$
$(b+c)x+ay=a^2+b^2-c^2.$

(2) $a^2y=x(b-c)(b+c)^2$
$x(b^2-c^2)(b+c)-a^2y=0.$

$$\left.\begin{aligned}&(1)\quad (b+c)x+ay=a^2+b^2-c^2\\ &(2)\quad (b+c)(b^2-c^2)x-a^2y=0\end{aligned}\right\}$$

$$\left.\begin{aligned}&(1)\quad a^2(b+c)x+a^2y=a^2(a^2+b^2-c^2)\\ &(2)\quad (b+c)(b^2-c^2)x-a^2y=0\end{aligned}\right\}$$

Adding] $a^2(b+c)x+(b+c)(b^2-c^2)x=a^2(a^2+b^2-c^2)$
$(b+c)(a^2+b^2-c^2)x=a^2(a^2+b^2-c^2)$
$(b+c)x=a^2$
$\therefore x=\frac{a^2}{b+c}.$

(2) $a^2y=x(b-c)(b+c)^2$
$=(b-c)(b+c)^2\times\frac{a^2}{b+c}$
$=a^2(b-c)(b+c)$
$=a^2(b^2-c^2)$
$\therefore y=\frac{b^2-c^2}{a}.$

2. JEAN.—A bag contains five coins, and it is known that they can be nothing but shillings or sovereigns; two shillings are drawn out together, and are not replaced. Determine the value of another draw of two coins. Give full explanation.

There are four hypotheses with respect to the coins to be regarded as equally probable before the observed event. (1) 5 shillings. (2) 4 shillings and 1 sovereign. (3) 3 shillings and 2 sovereigns. (4) 2 shillings and 3 sovereigns.

The probability of the observed event on these hypotheses is respectively:—

1, $\frac{4}{5}\times\frac{3}{4}$, $\frac{3}{5}\times\frac{2}{3}$, $\frac{2}{5}\times\frac{1}{2}$
= 1, $\frac{6}{10}$, $\frac{3}{10}$, $\frac{1}{10}$.

Hence after the observed event the probabilities of the hypotheses are respectively:—

$\frac{10}{20}$, $\frac{6}{20}$, $\frac{3}{20}$, $\frac{1}{20}$.

Now on the first hypothesis there are 3 shillings left in the bag, and the value of a draw is therefore two shillings.

On the second hypothesis there are 2 shillings and one sovereign left in the bag, and the value of a draw is

$$\frac{2+(2\times 21)_s.}{3}=\tfrac{44}{3}s.$$

On the third hypothesis there are 1 shilling and 2 sovereigns left in the bag, and the value of a draw is

$$\frac{(2\times 20)+(2\times 21)_s.}{3}=\tfrac{82}{3}s.$$

On the last hypothesis there are 3 sovereigns left in the bag, and the value of a draw is 40 shillings.

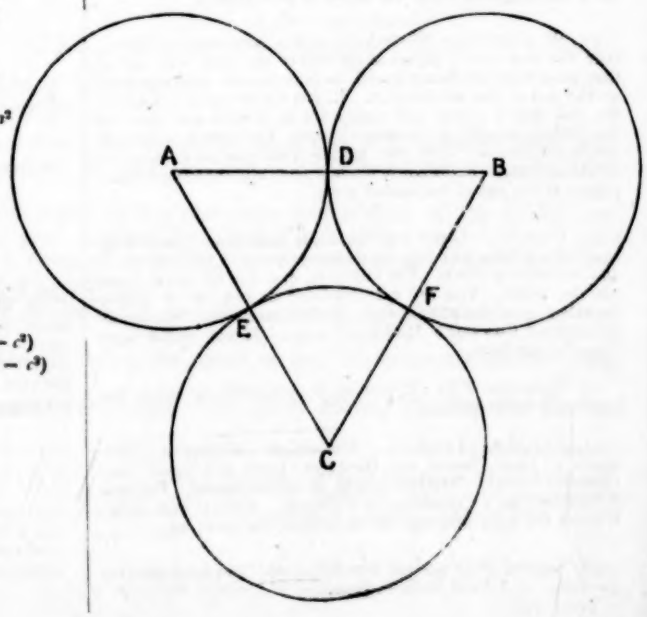
Hence the whole value of another draw

$$=\left[(\tfrac{10}{20}\times 2)+\left(\frac{\overset{2}{6}}{\underset{5}{20}}\times\frac{\overset{11}{44}}{3}\right)+\left(\frac{\overset{3}{3}}{\underset{10}{20}}\times\frac{\overset{41}{82}}{3}\right)+(\tfrac{1}{20}\times 40)\right]s.$$

$= (1+\frac{33}{5}+\frac{41}{10}+2)s.$
$= (3+4\frac{3}{5}+4\frac{1}{10})s.$
$= 11\frac{1}{2}s.$
= <u>11s. 6d.</u> Ans.

Mensuration.

1, JOHN BULL.—Six equal circles of radius *a* are placed so that each touches two others, their centres being all on the circumference of a circle; find the area which they enclose.



Area enclosed = Area of circle of radius a + 6 times area of space DEF;

Area of DEF = Area of equilateral triangle ABC − 3 times area of ADE

= Area of equilateral triangle of side $2a$ − 3 times $\frac{1}{6}$ area of circle of radius a

= Area of triangle of base $2a$ and perpendicular height $a\sqrt{3} - \frac{1}{2}$ area of circle of radius a

$= a^2\sqrt{3} - (\frac{1}{2}a^2 \times \frac{22}{7})$

$= a^2\sqrt{3} - \frac{11a^2}{7}$

$= a^2(\sqrt{3} - 1\frac{4}{7})$;

$\therefore$ Area enclosed $= a^2 \times 3\frac{3}{7} + 6a^2(\sqrt{3} - 1\frac{4}{7})$

$= a^2(3\frac{3}{7} + 6\sqrt{3} - 8\frac{4}{7})$

$= a^2(6\sqrt{3} - 4\frac{4}{7})$.

2. TAGGARD.—Find the cost of painting a dog kennel 5 feet long, 2 feet wide, each side being 2 feet high, and the perpendicular height of the ridge of roof from the ground being $3\frac{1}{2}$ feet, at 3d. per square foot. *(Scholarship, 1882.)*

Height of ridge from sides $= (3\frac{1}{2} - 2)$ ft.

$= 1\frac{1}{2}$ ft.;

Breadth of side of roof $= \sqrt{(1\frac{1}{2})^2 + 1^2}$ ft.

$= \sqrt{1\frac{9}{16} + 1}$ ft.

$= \sqrt{2\frac{9}{16}}$ ft.

$= \frac{5}{4}$ ft.;

Area of sides $= \{(5 \times 2) \times 2\}$ sq. ft.

$= 20$ sq. ft.;

,, roof $= \{(5 \times \frac{5}{4}) \times 2\}$ sq. ft.

$= (1\frac{2}{3} \times 10)$ sq. ft.

$= 16\frac{2}{3}$ sq. ft.;

,, ends $= [\{(2 \times 2) + (1 \times 1\frac{1}{2})\} \times 2$ sq. ft]

$= (5\frac{1}{2} \times 2)$ sq. ft.

$= 10\frac{2}{3}$ sq. ft.;

$\therefore$ Total area to be painted $= (20 + 16\frac{2}{3} + 10\frac{2}{3})$ sq. ft.

$= 47\frac{1}{3}$ sq. ft.;

$\therefore$ Cost of painting $= (47\frac{1}{3} \times 3)$d.

$= 142$d.

$= \underline{11}$s. $\underline{10}$d. Ans.

3. CYCLOPS.—Find how many shillings can be placed on a table round another shilling in contact with it and each other. What would be the value of a silver coin three times as thick as a shilling which would just cover them all?

(Harrow School Entrance Examination, 1886.)

Number of circles that can be placed round another circle, all of the same size, is six, for distance of points of contact of two adjacent circles with central circle is equal to radius of circle, and circumference is equal to six times the radius.

$\therefore$ Number of shillings = 6. Ans.

Diameter of coin that would cover them all = 3 times diameter of shilling;

Now circles are to one another as the square of their radii or diameters;

$\therefore$ Value of silver coin $= 1$s. $\times 3^2 \times 3$

$= 27$s.

$= \underline{£1\ 7}$s. Ans.

Trigonometry.

1. TRURO.—Investigate an expression for the radius of a circle, which touches one side of a triangle and the other two sides produced.

If R_1 is the radius of the circle touching side a and the other two produced, and R_2 that of the circle touching b and the other two produced, show that

$$R_1 R_2 = ab(\cos \tfrac{1}{2} C)^2.$$

(Science and Art, 1879.)

N.B.—The latter part of the question only is required.

$$R_1 = \frac{a \cos \frac{B}{2} \cos \frac{C}{2}}{\cos \frac{A}{2}}$$ (*Todhunter's* 'Plane Trigonometry,' page 185),

$$R_2 = \frac{b \cos \frac{A}{2} \cos \frac{C}{2}}{\cos \frac{B}{2}}$$

$$\therefore R_1 R_2 = ab \times \frac{\cos \frac{B}{2} \cos \frac{C}{2}}{\cos \frac{A}{2}} \times \frac{\cos \frac{A}{2} \cos \frac{C}{2}}{\cos \frac{B}{2}}$$

$$= ab \times \cos \frac{C}{2} \times \cos \frac{C}{2}$$

$$= ab(\cos \tfrac{1}{2} C)^2.$$

2. MOSS.—Calculate the ratio of the parts into which a regular pentagon is divided by a line joining an angular point to either end of the opposite side. (*Science and Art*, 1881.)

If a represent side of regular polygon and n number of sides,

$$\text{Area of polygon} = \frac{na^2}{4} \cot \frac{\pi}{n};$$

$$\text{Angle of polygon} = \frac{(n-2)\pi}{n}.$$

$$\therefore \text{Area of regular pentagon} = \frac{5a^2}{4} \cot 108°$$

$$= \frac{5a^2}{4} \cot 36°.$$

One of the parts into which the pentagon is divided is an isosceles triangle of side a and included angle

$$\frac{(5-2)\pi}{5} = \frac{3 \times 180°}{5} = 108°.$$

$\therefore$ Area of triangle $= \frac{1}{2}a^2 \sin 108°$

$$= \frac{a^2}{2} \sin 72°.$$

$\therefore$ One part : Other part

$:: \frac{a^2}{2} \sin 72° : \frac{5a^2}{4} \cot 36° - \frac{a^2}{2} \sin 72°,$

$:: \frac{1}{2} \sin 72° : \frac{5}{4} \cot 36° - \frac{1}{2} \sin 72°,$

$:: 2 \sin 72° : 5 \cot 36° - 2 \sin 72°,$

$:: 2 \times 2 \sin 36° \cos 36° : 5 \frac{\cos 36°}{\sin 36°} - 2 \times 2 \sin 36° \cos 36°,$

$:: 4 \sin^2 36° : 5 - 4 \sin^2 36°,$

$:: 4\left(\frac{\sqrt{10 - 2\sqrt{5}}}{4}\right) : 5 - 4\left(\frac{\sqrt{10 - 2\sqrt{5}}}{4}\right)^2,$

$:: \frac{\sqrt{100 - 40\sqrt{5} + 20}}{4} : 5 - \frac{\sqrt{100 - 40\sqrt{5} + 20}}{4},$

$:: \frac{\sqrt{120 - 40\sqrt{5}}}{4} : 5 - \frac{\sqrt{120 - 40\sqrt{5}}}{4},$

$:: \sqrt{1\frac{1}{2} - \frac{1}{8}\sqrt{5}} : 5 - \sqrt{1\frac{1}{2} - \frac{1}{8}\sqrt{5}}.$

3. B'HAM.—If x satisfy the two equations

$$x^2 + a^2 - 2ax\cos\theta = b^2$$
$$x^2 + a^2 - 2ax\cos(60^\circ - \theta) = c^2,$$

show that $2x^2 = a^2 + b^2 + c^2 \pm 4\,S\sqrt{3}$,
where S denotes area of triangle whose side are a, b, and c. (*Science Subject V.*, 1884.)

(1) $x^2 + a^2 - 2ax\cos\theta = b^2$

$$x^2 + a^2 - b^2 = 2ax\cos\theta$$
$$\therefore \cos\theta = \frac{x^2 + a^2 - b^2}{2ax}$$
$$\cos^2\theta = \left(\frac{x^2 + a^2 - b^2}{2ax}\right)^2$$
$$= \frac{x^4 + a^4 + b^4 + 2a^2x^2 - 2b^2x^2 - 2a^2b^2}{4a^2x^2}.$$

(2) $x^2 + a^2 - 2ax\cos(60^\circ - \theta) = c^2$

$$x^2 + a^2 - c^2 = 2ax\cos(60^\circ - \theta)$$
$$= 2ax(\cos 60^\circ\cos\theta + \sin 60^\circ\sin\theta)$$
$$= 2ax\left(\tfrac{1}{2}\cos\theta + \frac{\sqrt{3}}{2}\sin\theta\right)$$
$$= \frac{x^2 + a^2 - b^2}{2} + ax\sqrt{3}\sin\theta$$
$$ax\sqrt{3}\sin\theta = x^2 + a^2 - c^2 - \frac{x^2 + a^2 - b^2}{2}$$
$$= \frac{2x^2 + 2a^2 - 2c^2 - x^2 - a^2 + b^2}{2}$$
$$\therefore \sin\theta = \frac{x^2 + a^2 + b^2 - 2c^2}{2ax\sqrt{3}}$$
$$\sin^2\theta = \left(\frac{x^2 + a^2 + b^2 - 2c^2}{2ax\sqrt{3}}\right)^2$$
$$= \frac{x^4 + a^4 + b^4 + 4c^4 + 2a^2x^2 + 2b^2x^2 - 4c^2x^2 + 2a^2b^2 - 4a^2c^2 - 4b^2c^2}{12a^2x^2}.$$

$$\text{Sin}^2\theta + \cos^2\theta = \frac{x^4 + a^4 + b^4 + 4c^4 + 2a^2x^2 + 2b^2x^2 - 4c^2x^2 + 2a^2b^2 - 4a^2c^2 - 4b^2c^2}{12a^2x^2} + \frac{3x^4 + 3a^4 + 3b^4 + 6a^2x^2 - 6b^2x^2 - 6a^2b^2}{12a^2x^2}$$
$$1 = \frac{4x^4 + 4a^4 + 4b^4 + 4c^4 + 8a^2x^2 - 4b^2x^2 - 4c^2x^2 - 4a^2b^2 - 4a^2c^2 - 4b^2c^2}{12a^2x^2}$$
$$3a^2x^2 = x^4 + a^4 + b^4 + c^4 + 2a^2x^2 - b^2x^2 - c^2x^2 - a^2b^2 - a^2c^2 - b^2c^2$$
$$x^4 - a^2x^2 - b^2x^2 - c^2x^2 = -a^4 - b^4 - c^4 + a^2b^2 + a^2c^2 + b^2c^2$$
$$x^4 - (a^2 + b^2 + c^2)x^2 + \left(\frac{a^2 + b^2 + c^2}{2}\right)^2 = \frac{a^4 + b^4 + c^4 + 2a^2b^2 + 2a^2c^2 + 2b^2c^2}{4} - a^4 - b^4 - c^4 + a^2b^2 + a^2c^2 + b^2c^2$$
$$= \frac{-3a^4 - 3b^4 - 3c^4 + 6a^2b^2 + 6a^2c^2 + 6b^2c^2}{4}$$
$$= \frac{3(-a^4 - b^4 - c^4 + 2a^2b^2 + 2a^2c^2 + 2b^2c^2)}{4}$$
$$= \frac{3(a + b + c)(a + b - c)(a + c - b)(b + c - a)}{4}$$
$$= \frac{3 \times 16S}{4} \text{ (where S = area of triangle whose sides are } a, b, \text{ and } c)$$
$$x^2 - \frac{a^2 + b^2 + c^2}{2} = \pm 2S\sqrt{3}$$
$$x^2 = \frac{a^2 + b^2 + c^2}{2} \pm 2S\sqrt{3}$$
$$\therefore 2x^2 = a^2 + b^2 + c^2 \pm 4S\sqrt{3}.$$

Publications Received.

Bell, G., and Sons—
Syllabic Spelling. Parts 1 and 2. By C. Barton.

Blackie and Son—
Commercial Education. An Address by Dr. W. G. Blackie.

Chambers, W. and R.—
Test Exercises in Algebra. Stages 1, 2 and 3.

Chapman and Hall—
An Elementary Text-Book of Practical Metallurgy. By A. Roland Gower.

Curwen, J., and Son—
School Cantatas:
The Fairy Grotto. By G. W. Stratton.
Prairie Life. By A. T. Foxwell.
The Training College Music Course. By E. Mills, Mus.Bac.

Heywood, John—
Manchester Tracts on Education. By J. H. Newbold, B.A.
Tract 2, Overstrain in Primary Schools.
Tract 3, Technical Education.

Hodgson, F.—
The Elements of Logarithms. By W. Gallatly, M.A.

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Movable Alphabets and Numerals for Elementary Schools and Home Teaching.

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Longmans' Junior School Geography. By G. G. Chisholm, M.A., B.Sc.
The 'Practical' Mental Arithmetic for Schools.
Dress Cutting Out. By Mrs. Greenfell and Miss Baker.

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Geography of the British Isles. By Archibald Geikie, LL.D., F.R.S.
Arithmetic for Beginners. By the Rev. J. B. Lock, M.A.

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Little Favourites: Juvenile Poems. Arranged by Bella Gall.

Moffatt and Paige—
Macaulay's Essay on Addison (with Notes).

Murray, John—
The Eton Latin Grammar. By Francis Hay Rawlins, M.A., and William Ralph Inge, M.A.
The Eton Horace, Part I., Text, Odes, Epodes, &c.
" " Notes.

National Society's Depository—
Scholarship Questions. 1887.
Sight-Singing and the Theory of Music.

Nelson, T., and Sons—
Young Folks' Natural History. Standard IV.
The Rocket. Standard V.

Philip, G., and Son—
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A Manual of Phonography.

Skerry, G. E.—
The Practical Guide to the Civil Service and Professions. By G. E. Skerry.

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The Cornhill Magazine. May.

Swan Sonnenschein and Co.—
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The Student Interpreter's Guide.
Lower Division Men Clerks' Guide.
The Higher 'Exam.' Coach.
Complete Guide to the London Matriculation.

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Electricity and Magnetism. By T. Dunman and Chapman Jones.

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For Sale.—Prince's 'School Management,' 2s.; Park's 'Manual of Method,' 1s.; Major's 'How to Earn Merit Grant,' 3s.; Saunder's 'Class Management,' 1s.; 'Notes of Lessons,' by W. Taylor, 1s.; Moffatt's 'How to teach Grammar,' 9d.; Moffatt's 'How to teach Arithmetic,' 1s.; Todhunter's Euclid, 1s. 10d.; Collier's 'Advanced History,' 1s. 4d.; Hughes' 'Modern Geography' (Revised), 1s. 10d.; Heywood's 'Complete Guide to Scholarship and Certificate,' 1s.; including half postage.—Teacher, 18, Rishton-lane, Bolton.

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Head Master of Christ Church School, Macclesfield.

READING.

A candidate whose reading requires much attention to be passable is generally 'a bad all round man' with very little chance of success. Yet easy as it is to read tolerably and fluently, and thus score a moderate number of marks, it is astonishing how few really good readers—good elocutionists—there are who show that proficiency '*in the higher qualities of Reading (such as expression, modulation of the voice, and correct delivery of long and involved sentences)*' which is necessary to secure a high position. Mere mechanical accuracy may easily be obtained by constant recourse to a dictionary and by conversation with educated persons. Fluency, too, may be acquired with equal facility by constant practice; but these two qualities alone are far from constituting elocution. For this accomplishment are required many and varied endowments, some mental, others bodily—a quick intelligence, a vivid imagination, a lively sympathy, a sound judgment, a flexible voice, and a good ear.

To read all passages well, the whole of these qualifications sedulously cultivated are necessary, and as they are somewhat conflicting very few persons possess them in such symmetry as to be good 'renderers' of every style of composition—to be able to range 'from grave to gay, from lively to severe.'

How is our Student to correct his defects and acquire the various styles?

We cannot pretend to wade through, and bid him beware of, all the various provincial defects or vulgarisms, and to suggest remedies for them, but the student will be credited with an ordinary amount of culture and discernment.

First, let him study the passage before reading it (even at the Examination it should hurriedly be looked over); second, let him read to good readers, to any public audience, to his class, to his companions; third, let him declaim to himself—thrusting aside the fear of being too theatrical (everybody will here quote to him the example of Demosthenes); fourth, he should listen to good preachers, to attain a grave style—to good comedians, tragedians, and orators to secure a playful, a solemn and mournful, and a generally impressive style.

Read ALOUD, therefore, humorous, ironical, pathetic, tragic, theological, and political writings (devoting particular attention to the books selected by the Department for your English), having previously studied them, and entered within the author's meaning, and particularly endeavouring to overcome any physical defects or impediments.

Speeches, plays, and sermons composed especially for actual delivery or performance, obviously afford greater facilities for improvement in reading, than books intended for silent perusal and the quietude of the study.

By attention to the foregoing hints, not only good reading may be secured, but one's style of literary composition will be most materially improved.

'*Acting Teachers must read to the Inspector at his annual visit to their schools. They are not required to recite.*'

ROUTINE FOR JUNE. (MALES.)

DAY	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
MONDAY	Draw up a weekly Routine for a School of 200 Scholars and 7 Standards, staff consisting of Head, Assistant, and 2 P. T.'s.	Revise Euclid, Book III.	Paraphrase Lines 116—135, of Cæsar, Act III. Scene 2	First 100 Deductions of Egan, Part II.	Paraphrase Comus, Lines 555—574	Commerce of England	Persons or deities, &c., mentioned in Comus	Map of British South Africa	History — Thirteenth and Fourteenth chapters of McCarthy	School Management — Rewards and Punishments	Deductions. — 131—145 of Egan, Part II.	Revise Syntax of Nouns, Pronouns, and Verbs
TUESDAY	Political Geography of British South Africa	Arithmetic — Race and Train Questions involving different rates of speed	Outlines of English History, to end of Richard II.	Arithmetic. — More difficult problems involving the L.C.M.	History — Twelfth and Thirteenth chapters of McCarthy	Notes of Lessons on 'Colonization'	Study the Syntax of Verbs	Algebra — Arithmetical and Geometrical Progression	Statutes of 'Mortmain,' 'De Tallagio non Concedendo,' 'Provisors,' 'Treasons'	Revise Third Book of Euclid	Notes and Text of Comus to line 813	Management of the Voice, Windows, Gas-lights, and Wall-colouring of Schoolroom
WEDNESDAY	Problems involving simultaneous Quadratics	Revise first 37 pages of Jevon's Logic Primer	First 85 Deductions of Egan, Part II.	Algebra — Arithmetical Progression	Euclid, Book IV.	Write out the character of Brutus	Deductions — 116—130 of Egan, Part II.	Paraphrase (About p. 11 of Essay on Milton) 'The fascination of sea and loveliness. . . . . they can excite a strong public feeling'	How climate affects 'National Character'	Map of Hindostan	Mensuration of the Sphere or Arithmetic	History — Revise McCarthy
THURSDAY	Write 30 lines of Composition upon 'When love begins to sicken and decay it useth an enforced ceremony'	Write a Large-Hand Copy of the words 'Baron von Hardenberg,' and 30 Small-Hand lines of 'The castled crags of Drachenfels'	First IX. Propositions of Euclid, Book IV.	Political Geography of British South Africa	Compound Interest with its Algebraic Formulæ	Lives of Wallace, The Black Prince, John of Gaunt, and Wyclif	Revise Miscellaneous Arithmetical Problems (Capel's Catch Questions)	History — Fifteenth chapter of McCarthy	Algebra — Harmonical Progression	Notes and Text of Cæsar to end of Act IV. Scene 2	Algebra — The Three Progressions	Notes of Lesson on 'The Cabinet System'
FRIDAY	Notes of Cæsar to end of Act IV. Scene 2	Formation of Dew, Hoar Frost, Hail, Snow, Rain, and Fog	Mensuration of Cylinders or Arithmetic	Algebra — Geometrical Progression	Canon Warburton's Article in our May issue on Pestalozzi	Deductions — 101—115 of Egan, Part II.	Flora and fauna of Arctic and Antarctic Zones	Revise Second Book of Euclid	Write out Macaulay's observations upon Comus (Essay on Milton)	Revise Deductions	Read carefully through the last half of the Essay on Addison	All Geography of Ireland
SATURDAY	Important Dates to end of Edward II.	Notes of Cæsar to end of Act IV. Scene 2	Revise Algebra	Water Supply for Schools. Construction of Buildings (To end of p. 67 of Carpenter's Hygiene)	Notes of Comus to line 658	The Summary Register	Revise First Book of Euclid	Mensuration of the Sphere or Arithmetic	All Geography of Scotland	Miscellaneous Arithmetical Problems (Capel's Catch Questions)	Outlines of English History to end of Henry V.	Revise Algebra	Sums involving areas of sides of solids, etc.	Important Dates to end of Richard II.	Revise Algebra	Write, *for future use*, a Summary of Canon Warburton's Article on Pestalozzi

ROUTINE FOR JUNE. (FEMALES.)

DAY	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
MONDAY	Draw up a Weekly Routine for a School of 200 Scholars; staff consisting of Head, Assistant, and 2 P. Teachers	Analyse, and Parse difficult words of Cæsar, Lines 208—221, Act III. Scene 2.	All Geography of England	American War of Independence	Explain with examples, 'Factor,' 'G.C.M.,' 'Power,' 'Prime Number,' 'Composite,' 'Ratio'	Political Geography of Victoria and New South Wales	State fully how you would diet a person recovering from a chest disease	Revise first 37 pages of Jevon's Logic Primer	Map of Canada	Arithmetic — Averages	Revise the Geography of Australia	Composition upon 'The influence of Printing upon civilization'
TUESDAY	Fox's Libel Bill. Trials of Wilkes and Horne Tooke. Letters of *Junius*	Exercises in Mental Arithmetic	Paraphrase Lines 29 to 47 of Act IV. Scene 2 (Cæsar)	Physical Map of Scotland	What would be a fair annual charge per child for clothing 30 girls aged from 10 to 13? Give particulars of cost & materials	Describe the different methods of patching; which do you prefer and why?	Water supply for Schools. Construction of Buildings. (To end of p. 67 of Carpenter's Hygiene)	What days of the week were (or will be) March 15th, 1867 May 10th, 1800 Dec. 31st, 1762 Jan. 2nd, 1899? Work other examples	Political Geography of remainder of Australia	Describe a good filter. How would you extemporise one with a tree-pot and sponge? Natural filtration	Distinguish between the duties of a child's maid, a kitchen maid, and an under house maid	Practise any 'Cutting-out' wherein you are most deficient.
WEDNESDAY	Describe six inexpensive and nutritious dinners for children, stating cost and amount of materials required	Notes of a Lesson on 'Colonization'	Procure a 'Scale Drawing Book' and draw therein the required sewing diagrams	Gordon Riots (1780) Birmingham Riot (1791)	Give and explain the rule for reducing Vulgar Fractions to Decimals	Syntax of Nouns, Pronouns, and Verbs	Revise Geography of Scotland	What properties are contained in the fibrin, albumen, and gelatine of flesh? Why is fresh meat more nutritious than salt?	Canon Warburton's Article on Pestalozzi in our May issue	Study the text of the Essay upon Addison	Describe the various methods of repairing stockings; and when should each be employed?	The Summary Register.
THURSDAY	Map of Australia	Practise 'grafting, Swiss darning, running darn as for heel'	Arithmetic — Prices of 'Mixtures' various quantities at different prices	Management of the voice. Windows, Gas Lights, and Wall Colouring of the Schoolroom	How would you cook a mutton chop, a small sole, and a mackerel? How would you make a rice, a bread, and a batter pudding?	Lives and works of Pope, Thompson, Collins, Evelyn, Pepys, Hume	Analyse, and Parse difficult words of Cæsar, lines 18—26, Act IV. Scene 1.	American War of Independence	Arithmetic — Partnership	Revise Geography of Ireland	What are the duties of a nurse? Write out a few plain rules for her guidance	Prove that if the denomination of a Vulgar Fraction is x, there cannot be more than $(x-1)$ places in its equivalent decimal
FRIDAY	Vaccination: its History, Theory, Advantages, Disadvantages	Questions on Comp. Int. due at other than annual periods	History of South African Colonisation.	Paraphrase Lines 116—135 of Cæsar Act III. Scene 2.	Learn to cut out imitation lace, &c., in paper, suitable for trimming the various garments	Notes of a Lesson on 'the Cabinet System'	State what you know (mentioning advantages and disadvantages) of Sick, Death, and Benefit Clubs	Write 30 lines of Composition upon 'When love begins to sicken and decay it useth an enforced ceremony'	Practise 'Stocking Web and a 'Print Patch'	School-Management — Rewards and Punishments	Study the text of the Essay upon Addison	Outlines of History from 1748 to 1760
SATURDAY	What do you consider the finest passages in Cæsar, and how do they illustrate Shakespere's genius?	Stamp Act (1765). American Import Duties' Act (1767). Battles of Lexington and Bunker's Hill	Physical Features of Australia	Write a Large hand copy of the words 'Baron Von Hardenberg' and 30 Small hand lines of 'The castled crags of Drachenfels'	What are 'Consols,' 'Stock,' 'Brokerage,' 'Preference Stock'	Notes of Cæsar to end of Act IV. Scene 2	What puddings are suitable for sick people? Describe the making of three kinds	Practise the different 'darns' as before, and darning 'edge tear'	Arithmetic — Equation of Payments	Notes of Cæsar to end of Act IV. Scene 2	Procure a 'Scale Drawing Book' and draw therein the required sewing diagrams	Mutinies at the Nore, Spithead, and Plymouth — West Indian affairs	Revise the Syntax of Nouns, Pronouns, and Verbs	Geography of New Zealand	Revise any Arithmetic	Draw up for future use a Summary of the article on Pestalozzi

COMPOSITION

Is a most important part of the English required, and also intrudes into every subject of the curriculum, excepting perhaps Mathematics. However 'unadorned and plain' School Management, Geography, History, Domestic Economy, &c., may be by themselves, they can be rendered attractive by the graces of Literary Composition.

Without doubt, facts pleasingly set forth and orderly arranged will impress the examiner far more favourably than an equal amount of 'dry-as-dust' information. Notwithstanding, Composition is only 'the dress not the corpus' of the above-mentioned subjects; and when space is limited (as it generally is) it is well to remember that 'the body is more than the raiment.'

Throughout the generality of the subjects conciseness and incisiveness are therefore demanded, leaving to the Composition Exercise proper its more flowing and amplified style.

Thus, there are for the student two species of Composition to study and practice. First (and this involves skill in summarising and epitomising) the art of succinctly answering questions. Second, the general art of expressing ideas lucidly, powerfully and attractively.

Of the first kind we need say little, since our pupils may imitate with much advantage the 'Model Certificate Answers,' now appearing in THE PRACTICAL TEACHER. Yet we would recommend that they take, in addition, any tabulated information such as a list of battles or a catalogue of mountains, and endeavour to describe from them the given campaign or the physical features of the particular country. This is a very severe though very profitable test. Of the second kind we must discourse more fully yet still briefly.

The Exercise demanded by the Department must not be omitted under the penalty of total failure. It is essential to a pass. By the authorities it is recommended that only thirty minutes be devoted to this Exercise.

Generally the candidate has a choice of four subjects, upon any one of which he may write his essay. These subjects are picked from the wide universe, comprise both the abstract and the concrete—yet are nevertheless so selected that 'every schoolboy knows' something of one of them.

Were every paper set as fairly as the Composition Exercise no possible fault could be found. Excluding last year's themes (which are dealt with elsewhere in our columns), the following are the most recent :—

Males.—For 1886.—I. The Colonial and Indian Exhibition; II. The Queen's Jubilee; III. 'He that hath wife and children, hath given hostages to fortune;' IV. 'The gods are just, and of our pleasant vices make instruments to plague us.'—For 1885.—I. The discovery of the Bermudas;' II. The belief in witchcraft in the days of Elizabeth; III. 'Some kinds of baseness are nobly undergone;' IV. 'We are such stuff as dreams are made of.'—For 1884.—I. The arbitrary government of Richard II.; II. Trial by ordeal; III. 'Within the hollow crown that rounds the mortal temples of a king, keeps Death his Court.'

Females.—For 1886.—I. Any factory, building, or memorable spot; II. The distinction between Art and Science; III. The conditions to be fulfilled in a perfect drama; IV. 'For a crowd is not company, and faces are but a gallery of pictures.'—For 1885.—I. Recreation; II. Self Respect; III. The Post Office; IV. 'Sermons in stones—books in the running brooks.'—For 1884.—I. Early Friendship; II. Advantages and possible Abuses of Liberty of the Press; III. Art and Science for the people; IV. Write a story illustrating some popular proverb.

We have reason to judge that subjects like 'III. '86' and 'IV. '85' (Males) and 'IV. '86' and 'IV. '85' (Females) are favourite ones with the Department, and that their selection by the Examinee favourably impresses the average Examiner. Moreover, as they are chosen from the play or essay which has been studied, the answerer can by them show his appreciation of the spirit of the author, and has more scope for originality than in such as 'I. '86.'

In our Routine suitable themes will be found.

Before commencing to write, *the skeleton of the essay should be drawn up.* It is most important that the logical sequence should be carefully preserved, as it materially assists the articulation of the various sentences and paragraphs, and prevents that painful disjointedness which is often so apparent in the efforts of amateurs.

Next, *the style adopted should be carefully selected. Where possible 'make your theme your example.'* Just as there are onomatopoetic words, so there are onomatopoetic styles. How splendidly Denham observes this (his own) rule in apostrophising the Thames!

> 'O could I flow like thee, and make thy stream
> *My great example, as it is my theme,*
> Though deep yet clear, though gentle yet not dull,
> Strong without rage, without o'erflowing, full.'

Southey's 'Cataract of Lodore' furnishes an excellent example of an opposite style, yet suited to its subject. Study likewise Dryden's 'Alexander's Feast' and his 'Ode on St. Cecilia's Day,' Pope's 'Ode on St. Cecilia's Day,' and Collins' 'Passions'—all of which were composed purposely to illustrate this principle.

For Prose, note Shakespere's ever-varying style (when he nods it is not purposeless), and carefully discriminate the difference between Macaulay describing a battle, and discussing a philosophical theorem. Of course read Addison, but *avoid newspaper 'leaders.'*

See also our remarks on Reading (supra). A good reader cannot be a bad literary composer. His cultivated ear will not let him stray too far. He will mentally read-over his productions, and imagine their effect, detecting thereby a weakness here, a monotony there, or perhaps a rugged uncouthness, requiring the substitution of emphasis, variety, or a more refined flow of expression.

'Short sentences and simple Saxon words' are generally and wisely advised; but we venture to affirm that our rule 'adapt your style to your subject' is a better and more comprehensive one. Nobody advocates the use (or abuse) of Johnson's 'anfractuose' verbosity and Clarendonian sentences in order to inflate a simple story, but in subtle disquisitions and involved controversies the long-resounding word and the complex sentence are more than merely justifiable.

But beware of a mixed style. 'If thy heart fail thee do not climb at all.' Compare (1) '*He put out the fire.*' (2) '*He extinguished the conflagration.*' (3) '*He put out the conflagration.*'

No. (1) is the best in describing a simple incident, but bad as No. (2) is, it is better than No. (3) which is 'horribly mixed.'

Begin your sentences with different parts of speech, except where the emphasis of repetition dictates otherwise.

COMPARE.

Longer Sentences commencing in varied ways.	*Shorter Sentences beginning with Nouns or Pronouns.*
'Of all poets who have introduced into their works the agency of supernatural beings, Milton has succeeded best.	Poets have often introduced into their works the agency of supernatural beings. Milton has succeeded better than any of them.
Here Dante decidedly yields to him; and as this is a point on which many rash and ill-considered judgments have been pronounced, we feel inclined to dwell on it a little longer.'	Dante decidedly yields to him here. This is a point on which many rash judgments have been pronounced. We feel inclined therefore to dwell on it a little longer.

For 'the emphasis of similar construction,' see Macaulay's 'Relief of Londonderry.'

Lastly, *be exceedingly careful to punctuate correctly.*

As any respectable Grammar gives the commonplace rules for Composition, we shall not occupy our space therewith.

ANSWERS TO CORRESPONDENTS.

We shall be pleased to reply briefly, and through this column, to any seeking information or advice.

NORTHUMBRIA.—At any of the Departmental Examinations the highest class can be (but seldom is) secured by taking only the compulsory subjects. Your drawing will greatly help you.

S. W. L., BIRMINGHAM.—No apologies are needed for again addressing us. *Queries* 1 *and* 3.—Yes. *Query* 2.—Doubtful.

(To be continued.)

How to Teach School Children to Sing from Notes.

BY W. G. McNAUGHT,

Associate of The Royal Academy of Music.

41. The tonic sol-fa notation of tune can be quickly understood by the most casual enquirer. The tonic sol-fa notation of time however requires closer examination, not merely because the signs employed are more arbitrary but because of the greater complexity of the facts to be shown. This circumstance sometimes leads teachers to neglect to study and teach time systematically and to put the blame upon the notation. But the educational advantage of the tonic sol-fa notation of time are great. The important facts of time are—

1st. The division of music into pulses.
2nd. The accent of pulses (forming measure).
3rd. The regular period of pulses.

In tonic sol-fa notation these facts are constantly shown by the signs for pulses, strong, weak and medium, and by placing these signs as far as practicable, equal in distance from one another; thus :—

| : | : | : ‖

shows strong and weak pulses in succession, and

| : : | : : | : : ‖

shows, strong, weak, weak, in succession.

The point in teaching is to exercise unusual care to make certain that the meaning of these arbitrary signs is familiarly known.

42. In teaching time-notation on the blackboard, much depends upon the ability of the teacher to write clearly. The strong pulse-signs should be thick and quite perpendicular, and the dots of the weak pulses should be large and close to each other, and pulse signs of all kinds should be equidistant. Much prejudice against the Tonic Sol-fa notation of time has been occasioned by the careless way in which it is too often written.

43. The first lessons in time notation to children should make the meaning of the signs abundantly clear. It is best to begin a lesson by drawing an exercise on the blackboard piecemeal in the presence of a class. A finished exercise, with notes in the pulses, presents at first too much at once for the eye to take in. Analysis of this sort can be better done after synthesis is well practised.

44. After clearly showing the strong and weak pulse signs, the idea of *measure* (the number of pulses from one strong pulse to the next) must be taught. It is best to get pupils to feel the grouping of pulses into sets of two's by ear exercises. For instance, the teacher sings three or four sets of strong weak, and asks the class to state how many *sets* they heard. Next, the class should sing from dictation two, three or more sets. The word measure should now be taught, and the class will then proceed to tell measures from the notation. Supposing the following to be written on the board in accordance with the directions given in sec. 42 :—

| : | : | : | : ‖

(The double line or bar shows the end of the exercise.) The teacher should draw a curve to show the first measure and get children to come out to draw similar curves.

45. Although the code requirements nowhere test time and tune in combination it is most desirable that they should be connected in at least a simple manner from almost the earliest stages. All the lessons suggested in sections 37 to 44 should be given to Div. II., while they are learning the Doh chord, and the time and tune so far explained should be combined, say as follows :—

| d :d | s :s | m :s | s :m | d :d ‖

| d :d | m :m | d :m | s :s | d' :d ‖

| d :m | s :m | d :s | m :d | s :d |

| d :s | m :s | d :d' | m :s | m :d ‖

The courses and educational charts published by Messrs. Curwen & Sons give many similar exercises.

46. The next step is to teach continuations. This may be done as follows: Teacher sings on a monotone to *laa* single tones sustained through two, three, four, &c. pulses, and elicits their value: the class sings in a similar manner at the dictation of the teacher: the continuation or 'keep on' mark is then taught and combined with easy tune. It is a good plan to get children to come out in turn and place 'keep on' marks where directed. Exercises such as the following are suggested.

| l :— | l :— | l :l | l :— | l :l | l :— ‖

| d :— | m :— | s :m | d :— | m :s | d' :— |

| d :m | s :m | d :— | s :— | m :d | d' :— ‖

| d :— | m :r | d :m | s :— | s :— | d' :t | d' :s | d' :— ‖

Care must be taken that the continuations are sung as such. Children soon fall into the bad habit of breaking continuations from the note in the preceding pulse.

47. The medium pulse and four pulse measure must now be taught. The methods already described will suffice. The medium accent should be introduced in an ear exercise, imitated from pattern and prominently shown on the blackboard. Coloured chalk is useful at this stage. The eye gets accustomed to detach the short stroke of of the medium accent when it has seen it written in blue or yellow chalk. It is not necessary to spend much time to secure a refined distinction between two pulse and four pulse measure. The best performances of artistes often do not make perceptible distinctions between two and four pulse measure. Where the distinction is called for it is mostly made instinctively rather than in obedience to notation.

48. Pieces of music commence on weak or medium pulses quite as often as upon strong pulses. When the musical phrases of a piece commence upon strong pulses the measure is said to be *primary*, and when they commence on weak or medium pulses the measure is said to be *secondary*. Examples :—

Primary Measure.

| : | : | : ‖

Gen - tle spring is com - ing.

Secondary Measure.

: | : | : ‖

The ec - ho of the horn.

49. Almost all the best tonic sol-fa teachers now employ a system of time names engrafted upon the method shortly before Mr. John Curwen's death. These time names are not a necessary feature of tonic sol-fa teaching: they are simply one method of cultivating the *sense* of rhythm, and they are found to be a most useful means of communication between teacher and pupil. They are mainly used in monotoning time exercises and in time ear exercises.

50. The time name for a whole pulse tone struck is TAA and for a whole pulse continuation -AA (*i.e.* TAA with the T omitted and a hyphen substituted).

51. The code requirements make no mention of time names. Therefore they should be used only as preliminary practice and all exercises should in addition be sung on a monotone to *laa*.

DIVISION II.

SPECIMEN CODE TESTS.

Time.

Two-pulse measure.

Doh is F.

(1) | d :— | m :r | d :m | s :— | s :f | m :f | m :r | d :— ||

Doh is D.

(2) | d :s | m :— | s :m | d' :— | d' :t | d' :s | l :s | d :— ||

Doh is G.

(3) | d :s_1 | d :m | r :— | d :— | m :s | s_1 :l_1 | t_1 :t_1 | d :— ||

Doh is F.

(4) | d :r | m :— | m :f | s :— | s :d | r :— | m :r | d :— ||

Doh is E.

(5) | d :t_1 | d :m | r :d | r :— | m :s | f :m | s :— | d' :— ||

Doh is A.

(6) { :s_1 | d :t_1 | d :r | m :— | r :— | m :s_1 | l_1 :t_1 | d ||

Doh is D.

(7) { :m | s :d | r :m | f :— | s :— | l :s | l :t | d' ||

Doh is G.

(8) { :d | t_1 :d | r :d | s_1 :— | m :— | r :d | d :t_1 | d ||

Four-pulse Measure.

(9) Doh is E.

| d :— | r :— | m :d | s :— | s :l | s :f | m :r | d :— |
| s :— | d' :— | t :l | s :— | l :s | f :m | m :r | d :— ||

(10) Doh is B♭.

| d :— | t_1 :— | d :s_1 | m_1 :— | f_1 :s_1 | l_1 :t_1 | d :r | d :— |
| s_1 :— | d :— | s_1 :— | m_1 :— | f_1 :m_1 | s_1 :d | t_1 :— | d :— ||

(11) Doh is D.

{ :m | s :f | m :s | f :— | m :m | r :m | f :s | l :— | s |
{ :s | d' :— | t :l | s :l | s :d | m :— | r :— | d :— |— |

(12) Doh is G.

| d :— | t_1 :— | d :r | m :— | s_1 :— | l_1 :— | t_1 :d | r :— |
| m :— | s :— | f :m | r :d | t_1 :l_1 | t_1 :d | r :— | d :— ||

(13) Doh is B♭.

{ | d :— | d :t_1 | d :r | m :— | s_1 :— | l_1 :t_1 | d :r | d :— |
{ | r :— | m :r | d :t_1 | d :— | s_1 :— | l_1 :— | t_1 :— | d :— ||

(14)

{ :m | r :d | t_1 :d | m :— | d :s_1 | l_1 :t_1 | d :r | m :— | r |
{ :d | t_1 :d | r :d | t_1 :— | d :— | r :— | m :— | r :— | d ||

The foregoing tests are written in tune as well as in time. They can be first written on the board with only 'laa' for the struck notes. But for the pleasure and profit of pupils they should be sung afterwards to some easy tune form. When sung in tune they should be sung in the Keys marked. It will be observed that some of the tests are in *secondary measure.*

(To be continued.)

Model Answers to Pupil Teacher Examination Papers.

21st April, 1888.

END OF FIRST YEAR.

Arithmetic.

(*Do three questions only, including question* 4, *if you can.*)

MALES ONLY.

1. Find the G.C.M. of 53261 and 52779. *Prove* that the number you have found is the G.C.M.

2. Reduce £5 6s. 9d. to the decimal of £100; and 3 tons 11 cwt. 55 lbs. to the decimal of 32 tons 3 cwt. 47 lbs.

3. Add together: ·175 of 2½ acres, 17·19 of 3 roods, 3·125 of 1¼ acres.

4. How would you prove by division of a line that $\frac{3}{7}$ of $\frac{7}{8} = \frac{21}{56}$? Multiply $1\frac{3}{8}$ of $5\frac{1}{4}$ by $\frac{4}{17} \div 2\frac{1}{2}$.

(1)

```
52779)53261(1
      52779
        482)52779(109
            482
            4579
            4338
             241)482(2
                 482
```

Proof.—241 measures 52779. It also measures 53261. ∴ it is a common measure.

It is also the G.C.M. For any number which measures these two numbers measures also their difference, *i.e.*, 482. For the same reason any number which measures 482 and 52779 measures the difference between 52779 and any multiple of 482, *i.e.*, 241.

But no number greater than 241 measures it. ∴ 241 is the G.C.M.

(2) £5 6s. 9d. to dec. of £100.

$= \frac{£5\ 6s.\ 9d.}{£100}$

$= \frac{5\frac{27}{240}}{100}$

$= \frac{427}{8000}$

$= \frac{·427}{8}$

$= \underline{·053375}$. Ans.

3 tons 11 cwt. 55 lbs. to the dec. of 32 tons 3 cwt. 47 lbs.

= 3 tons 11 cwt. 55lbs.
32 tons 3 cwt. 47lbs.

$= \frac{3003}{71603}$

$= \frac{1}{9}$

$= \underline{·1}$. Ans.

(3) ·175 of 2½ a. + 17·19 of 3 r. + 3·125 of 1¼ a.

$= \frac{·875}{2}$ a. + $17\frac{19}{100} \times 3$ r. + $\frac{25}{8} \times \frac{5}{4}$ a.

= ·4375 a. + $51\frac{3}{5}$ r. + $\frac{125}{32}$ a.
= 1 r. 30 p. + 12 a. 3 r. 24 p. + 3 a. 3 r. 25 p.
= 17 a. 0 r. 39 p. Ans.

(4) (*a*) I should divide the line into 9 parts, and then each of these divisions into 7 parts. Each of these subdivisions would be $\frac{1}{63}$ of the whole line. $\frac{3}{7}$ of the whole line would contain 28 of these subdivisions. $\frac{1}{9}$ of them would be four subs., and ∴ $\frac{3}{7}$ would be 12 of them or $\frac{12}{63}$.

(*b*) $1\frac{3}{8}$ of $5\frac{1}{4} \times \frac{4}{17} \div 2\frac{1}{2}$

$= \frac{11}{8} \times \frac{21}{4} \times \frac{4}{17} \times \frac{2}{5}$

$= \underline{\frac{11}{10}}$. Ans.

FEMALES ONLY.

1. Make out in proper form the following bill:

7 lbs of cheese, at 8¾d. per lb.;
19 lbs. of butter, at 1s. 1½d. per lb.;
7½ lbs. of lard, at 10½d. per lb.;
9 doz. boxes of matches, at 9 for 6d.

2. Find by Practice the value of 5 acres 3 roods 25 poles, at £35 10s. per acre.

3. $\frac{7}{8}$ of an iceberg is immersed in water; if $\frac{9}{10}$ had been immersed, 22,000 *additional* cubic feet would have been immersed; find the number of cubic yards in the iceberg.

4. How would you prove by division of a line that $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{7}{8}$? Subtract $3\frac{1}{3} + 4\frac{3}{5}$ from $17\frac{7}{10}$.

(1)

London,
April 21st, 1888.

Mrs. Jones,
Bought of Henry Brown.

	£	s.	d.
7 lbs. of cheese at 8¾d. per lb.		5	1¾
19 lbs. of butter at 1s. 1½d. per lb.	1	1	4½
7½ lbs. of lard at 10½d. per lb.		6	6¾
9 doz. boxes of matches at 9 for 6d.		6	0
	1	19	0½

(2)

	£	s.	d.		
	35	10	0	=	value of 1 acre
			5		
	177	10	0	=	,, 5 acres
2 roods = ½ acre	17	15	0	=	,, 2 roods
1 rood = ½ of 2 rds.	8	17	6	=	,, 1 rood
20 pls. = ½ of 1 rd.	4	8	9	=	,, 20 pls.
5 pls. = ¼ of 20	1	2	2½	=	,, 5 ,,
	209	13	5¼	=	value of 5 a. 3 r. 25 p.

(3) $\frac{9}{10} - \frac{7}{8} = \frac{81 - 70}{90} = \frac{11}{80}$ addl.

$\frac{11}{80}$ = 22,000 cubic feet.
$\frac{1}{80}$ = 2,000 ,,
$\frac{80}{80}$ = 180,000 ,,
= 6,666⅔ cubic yards. Ans.

(4) I should divide the line into eighths. Then one half the line would represent four-eighths, one quarter would be two-eighths, and these added to one-eighth would make seven-eighths.

$$17\tfrac{7}{10} - (3\tfrac{1}{3} + 4\tfrac{3}{5})$$
$$= 10\tfrac{7}{10} - (\tfrac{1}{3} + \tfrac{3}{5})$$
$$= 10\,\frac{63 - (18 + 30)}{90}$$
$$= 10\tfrac{15}{90}$$
$$= 10\tfrac{1}{6}. \text{ Ans.}$$

Composition.

[The passage should be read *once* distinctly, and then the substance of it is to be written down from memory.]

A famous naturalist was walking along the cliffs with his favourite dog Nero, and sat down to write some notes, while the dog scampered about. After a time Nero returned, but found only his master's hat and stick. He had gone down the face of a rock in order to get a rare flower he saw there, and now found that the tide had risen, and that it was impossible for him to return. Seeing the head of the dog peering over the cliff at him, he shouted 'Nero, good fellow, I am in danger; go for help.'

Nero seemed to understand his meaning perfectly, for he ran off to a village which was near, and, having attracted some men by his excitement, led them to the cliff. They fetched ropes and soon pulled up the gentleman. He had much reason to be proud of his dog, for the place was lonely, and no one else could have heard him shouting.

Grammar.

MALE AND FEMALE.

(*Answer questions 1 and 2 and one other question.*)

1. By torch and trumpet *fast arrayed*
Each horseman *drew his* battle blade,
And *furious* every charger *neighed*
To join the dreadful *revelry*.

Say how many sentences there are in these lines, and distinguish the subject, predicate, and other parts of each.

2. Parse the words printed in italic.

3. Show the meaning and use of the final syllable in each of the following words, and give other examples of words similarly formed:—

Brighten, Heedless, Harmful,
Spinster, Reader, Coldish.

4. Make with each of the following words two sentences, so as to show that a word is not always the same part of speech:—

High (*a*) as an adjective, (*b*) as an adverb.
On (*a*) as a preposition, (*b*) as an adverb.
Light (*a*) as an adjective, (*b*) as a verb.
Step (*a*) as a noun, (*b*) as a verb.

(1) Two.
(*a*) *Subject*—Each horseman, fast arrayed by torch and trumpet,
Predicate—drew
Object—his battle blade.
(*b*) *Connective*—And
Subj.—Every charger
Pred.—neighed
Extension of Pred.—to join the dreadful revelry.

(2) *Fast*—adv. of time, mod. 'arrayed.'
arrayed—past part. of 'to array,' referring to 'horseman.'
each—distributive adj., qual. 'horseman.'
drew—verb, irreg., trans., act., ind., past, 3rd sing., agreeing with its nom. 'horseman.'
his—pers. pronoun, masc., sing., 3rd, poss. case, gov. by 'blade.'
furious—adv. of manner, modifying 'neighed.'
neighed—verb, reg., int., act., ind., past, 3rd sing., agreeing with its nom. 'charger.'
to join—verb, reg., trans., act., inf., pres., gov. by 'neighed.'
revelry—abstract noun, neut., sing., obj. case, gov. by 'to join.'

(3) *-en*—to make: forming verb from adj.; strengthen, weaken, widen.
-ster—agent: forming noun from verb; deemster, punster, trickster.
-less—without: forming adj. from noun; homeless, joyless, friendless.
-er—agent: forming noun from verb; player, binder, singer.
-ful—full of: forming adj. from noun; sorrowful, pitiful, wrongful.
-ish—having some of: adj. termination; reddish, brownish, whitish.

(4) *High*—as adj.: He climbed over a high wall.
as adv.: The water rose high above its usual limit.
On—as prep.: He walked on the wall.
as adv.: He read on till he was told to stop.
Light—as adj.: William carried a light stick.
as verb: I shall light the gas presently.
Step—as noun: She walks with a light step.
as verb: They step quickly on the street.

END OF SECOND YEAR.

Euclid.

MALES ONLY.

[All generally understood abbreviations and symbols for *words* may be used, but not symbols of *operation*, such as −, +, ×.]

(*Answer two questions, including question 3, if you can do so.*)

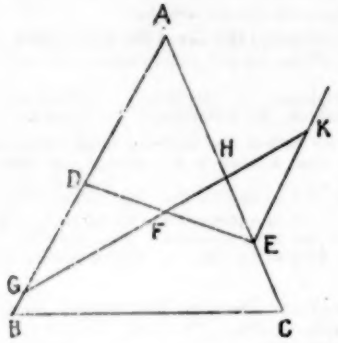
1. If two triangles have two sides of the one equal to two sides of the other, each to each, and have likewise their bases equal, the angle which is contained by the two sides of the one shall be equal to the angle contained by the two sides, equal to them, of the other.

Euclid, Book I., 8.

2. If from the ends of the sides of a triangle there be drawn two straight lines to a point within the triangle; these shall be less than the other two sides of the triangle, but shall contain a greater angle.

Euclid, Book I., 21.

3. If a straight line terminated by the sides of a triangle be bisected, no other straight line terminated by the same two sides can be bisected at the same point.



In the triangle ABC let the straight line terminated by the sides AB, AC be bisected at F. No other straight line terminated by AB, AC can be bisected at F.

If it be possible let any other line, as GFH, be bisected in F.

Then in triangle ADE the two ∠s ADE, AED are together < two right ∠s (I. 17).

From point E draw EK parallel to AD, and produce FH to meet EK in K.

Then in two △s FGD, FEK the ∠s FDG, GFD = ∠s KFE, FEK, each to each, and one side = one side, viz., DF = FE.

∴ (I. 26), △ FDG = △ FEK, and side FG = side FK.

But FH = FG (Hyp.)

∴ FH = FK, the less to the greater; which is impossible.

Wherefore if a straight line; &c.

Arithmetic.

(*Answer three questions only, including the last, if you can.*)

MALES ONLY.

1. Find the difference between the discount and the interest on a sum of £3,000, payable 5½ years hence at 4¼ per cent. per annum.

2. If 203 articles can be bought for £101 5s. 9¼d., how many may be bought for £104 5s. 7¾d.?

3. What saving to the country in annual interest would be effected by changing £7,105,100 Three per Cent. Stock at 102 to a 2½ per cent. Stock at 85?

4. Explain the term average, and illustrate your definition by the average length of a calendar month in the year 1888; and find the average of 7·125 of 8 guineas, 8·3⅓ of 8s. 3d. and £36 13s. 11d.

1. Interest = $3000 \times 5\frac{1}{2} \times 4\frac{1}{4} \div 100$.
= $30 \times$ £23 7s. 6d.
= $10 \times$ £70 2s. 6d.
= £701 5s.

£	£	£	£
$100\frac{187}{987}$	: 3000	: $\frac{187}{987}$	: x

$$x = \frac{3000 \times 187 \times 8}{8 \times 987}$$

$$x = \frac{187000}{329}$$

$x =$ £568 7s. $9\frac{139}{329}$d.

Diff. = £132 17s. $2\frac{190}{329}$d. Ans.

2. £101 5s. 9¼d. : 104 5s. 7¾d. : : 204 : 209. (art. art.) Ans.

3. £7,105,100 would produce—
7,105,100 × 3 × 100 = £213,153
It would sell out for—
7,105,100 ÷ 100 × 102
which being invested in 2½ @ 85 would produce interest

$$\frac{7105100 \times 102 \times 2\frac{1}{2}}{85} =$$ £191,837 14s.

The difference would therefore be £21,315 6s. Ans.

4. The term *Average* means the result obtained by dividing the sum of any number of terms by the number of terms. It is also called the *Mean*.

Thus, in 1888 there are twelve calendar months, the sum of whose days is 366. The average number of days ∴ = 366 ÷ 12 = 30½.

(7·125 of 8 guineas + 8·3⅓ of 8s. 3d. + £36 13s. 11d.) ÷ 3
= (7⅛ of 8 guineas + 8⅓ of 99d. + £36 13s. 11d.) ÷ 3
= (£59 17s. + 829d. + £36 13s. 11d.) ÷ 3
= £100 ÷ 3.
= £33 6s. 8d. Ans.

FEMALES ONLY.

1. Define the terms multiple, common multiple, least common multiple, and find the least common multiple of 99821 and 66355.

2. Add together ⅜ of 11s. 3d.; ⅞ of £4 10s. 4½d.; $1\frac{7}{11}$ of £2 7s. 8d.

3. What fraction is 3s. 3½d. of 11s. 1d.? 330 yds. of 1½ miles? 5½ hours of 330 seconds?

4. Write out the rule for converting a vulgar fraction to its equivalent decimal. Express $\frac{3}{40}$, $\frac{2}{1000}$ as decimal fractions, and work the sums also in such a way as to show the reason for the rule.

1. A multiple of any number is that number taken two or more times.

A common multiple is a number which contains two or more numbers an exact number of times without a remainder.

The least common multiple is the least number which contains two or more numbers an exact number of times without a remainder.

66355)99821(1
66355
33466)66355(1
33466
32889)33466(1
32889
577)32889(57
2885
4039
4039

G.C.M. = 577.

577)66355 · 99821
115 · 173

L.C.M. = 577 × 115 × 173
= 11,479,415. Ans.

2. ⅜ of 11s. 3d. + ⅞ of £4 10s. 4½d. + $1\frac{7}{11}$ of £2 7s. 8d.
= $\frac{3}{8} \times \frac{135}{12} + 5 \times 10\frac{1}{2} + 18 \times 4$ 4.
= 6s. 9d. + £2 10s. 2½d. + £3 18s.
= £6 14s. 11½d. Ans.

s. d.		
3 3½	330 yds.	5½ hrs.
11 1	1½ m.	330 secs.

$= \frac{39\frac{1}{2}}{133}$; $= \frac{1\frac{1}{2}\text{ f.}}{12\text{ f.}}$; $= \frac{5\frac{1}{2}\text{ hrs.}}{5\frac{1}{2}\text{ m.}}$

$= \frac{79}{266}$; $= \frac{1}{8}$; $= \frac{315}{5\frac{1}{2}}$

$= \frac{630}{11}$

$= 57\frac{3}{11}$.

4. Affix ciphers to the numerator, and divide the numerator by the denominator till there is no remainder, or till the figures in the quotient recur. Mark off as many decimal places beginning at the right hand as there have been added ciphers to the dividend.

(*a*) $\frac{3}{40} = \frac{75}{1000} = \underline{.075}$. Ans.

(*b*) $\frac{9}{1600} = \frac{5625}{1000000} = \underline{.005625}$. Ans.

Three whole numbers = three thousand thousandths. This, divided by 40, gives 75 thousandths or .075. Similarly in example (*b*).

Grammar.

(*Answer questions 1 and 2 and one other question.*)

1. *See* the wretch *that long has tossed*
On the thorny bed of pain,
At length *repair his* vigour *lost*
And breathe and walk again:
The meanest floweret of the vale,
The simplest note *that swells the gale*,
The common sun, the air, the skies,
To him are opening *Paradise*.

Express in your own words the meaning of this passage.

2. Analyse the first four lines.

3. Parse the words in italic.

4. Explain, by reference to the prefixes or affixes, the meanings of the following words; and put each word into a sentence of your own construction :—

Revert. Congregation. Submarine. Beautify. Victorious. Gratitude.

(1) Look at the poor man who for a great length of time has been confined to his room with pain and sickness! When his strength has returned sufficiently to enable him to walk abroad, the simplest flower that blows, the song of the homeliest bird, the sun, the air, the skies, give him such delight as to make him think he has entered Paradise.

(2) (*a*) See the wretch at length repair his vigour lost and breathe and walk again: Principal sentence.

(*b*) That long has tossed on the thorny bed of pain: Adjective sentence, qualifying wretch.

(*a*) *Subj.*—[You]
Pred.—see
Obj.—the wretch (direct)
repair his vigour lost and breathe and walk again at length (indirect).

(*b*) *Subj.*—that
Pred.—has tossed
Ext. of Pred.—long (time) on the thorny bed of pain (place).

(3) *See*—verb, irreg., trans., act., imp., 2nd, sing. or plural, agreeing with its nom. 'you.'
that—rel. pro., masc., 3rd, sing., relating to 'wretch,' nom. case to 'has tossed.'
long—adv. of time modifying 'has tossed.'
has—aux. to 'tossed,' indicating perf. tense.
tossed—past part. of 'to toss,' referring to 'that.'
has tossed—verb, reg., intrans., act., ind., perf., 3rd, sing., agreeing with its nom. 'that.'
repair—verb, reg., trans., act., inf., pres., gov. by 'see.'
his—pers. pronoun, masc., sing., 3rd, poss. case, gov. by 'vigour.'
lost—participial adj. qual. 'vigour.'
that—rel. pronoun, neut., sing., 3rd, referring to 'note,' nom. case to 'swells.'
swells—verb, reg., intrans., act., ind., pres., 3rd, sing., agreeing with its nom. 'that.'
gale—com. noun, neut., sing., obj., gov. by 'on' understood.
to—prep., showing relation between 'him' and 'are.'
him—pers. pro., masc., 3rd, sing., obj. case, gov. by 'to.'
Paradise—com. noun, used as a proper noun, neuter, sing., nom. case after 'are.'

(4) *Revert*—to turn back. He will revert to his old practices.
Congregation—a number meeting together. The congregation was very large.
Submarine—under the sea. The submarine cable was laid many years ago.
Beautify—to make beautiful, to adorn. She will try to beautify the house.
Victorious—having gained the victory. He was the leader of the victorious army.
Gratitude—state of being thankful. He was full of gratitude.

END OF THIRD YEAR.

Euclid.

MALES ONLY.

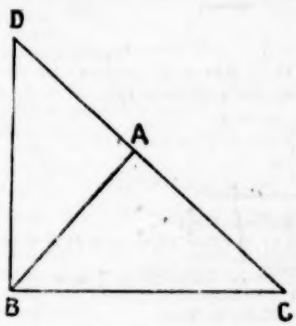
[All generally understood abbreviations and symbols for *words* may be used, but not symbols of operation, such as $-$, $+$, $\times$.]

(*Answer two questions, including Question 3, if you can do so.*)

1. If a straight line falling on two other straight lines make the exterior angle equal to the interior and opposite angle on the same side of the line; or make the interior angles on the same side together equal to two right angles; the two straight lines shall be parallel to one another.
(Euclid, Book I., 28.)

2. To describe a parallelogram that shall be equal to a given triangle, and have one of its angles equal to a given rectilineal angle.
(Euclid, Book I., 42.)

3. If the base angle of an isosceles triangle be one-fourth of the vertical angle, and from it a line be drawn perpendicular to the base to meet the opposite side produced, then the part produced, the perpendicular, and the remaining side, will form an equilateral triangle.



Let ABC be an isosceles triangle having $\angle A$ = four times $\angle B$. At B erect BD perpendicular to BC, and produce CA to meet BD in D. Then ABD is an equilateral.
Because the three interior $\angle$s of any $\triangle$ = two right $\angle$s, and $\angle$ BAC = 4 times $\angle$ ABC or ACB.
$\therefore \angle$ BAC = $\frac{4}{5}$ or $\frac{3}{5}$ of two right $\angle$s.
But $\angle$ DAB BAC = two right $\angle$s.
$\therefore \angle$ DAB = one third of two right $\angle$s.
And DBC is a right $\angle$ (Const.) and ABC is $\frac{1}{4}$ of two right $\angle$s, *i.e.*, $\frac{1}{2}$ of a right $\angle$.
$\therefore \angle$ DBA is $\frac{2}{3}$ of a right $\angle$.
And remaining $\angle$ BDA of triangle BDA is $\frac{2}{3}$ of a right $\angle$.
$\therefore \triangle$ DBA is equiangular. It is $\therefore$ equilateral.
Q.E.D.

Algebra.

MALES ONLY.

(*Answer three questions only, including Question 4, if you can do so.*)

1. *Prove* that $a - (b - c) = a - b + c$.
If I give away a shillings out of a purse containing b pounds and c sixpences, how many shillings have I left?

2. Divide $a^3 - b^3$ by $a^2 + a^2b + ab^2 + b^3$, and resolve your answer into factors.

3. Find the G.C.M. of $2x^2 - x - 1$ and $2x^2 + x - 3$, and simplify—

$$\frac{5}{2x^2 + x - 3} - \frac{3}{2x^2 - x - 1}$$

4. Give an example of an *identical* equation, and solve the equations :—

(1) $\frac{2x + \cdot0625}{2\cdot5} - \frac{x - \cdot125}{\cdot75} + \frac{7}{8} = 0$;

(2) $\frac{x - 5}{2} = \frac{(x - 2)^2}{2x - 5}$

1. If I subtract b from a, I have taken away c too much, for it is not b which has to be subtracted, but the difference between b and c.

I must therefore add an amount equal to c in return for subtracting c too much, *i.e.*,

$$a - (b - c) = a - b + c$$

($£b$ + c sixpences) − a shillings

$$= \left(20b + \frac{c}{2} - a\right)\text{sh.}$$

$$= (40b + c - 2a)\text{sh.} \quad \text{Ans.}$$

2. $a^3 + a^2b + ab^2 + b^3$) $a^3 - b^3$ ($a^3 - a^2b + ab^2 - b^3$

$a^3 + a^2b + a^2b^2 + a^3b^3$

$-a^2b - a^2b^2 - a^3b^3$

$-a^2b - a^2b^2 - a^3b^3 - a^4b^4$

a^4b^4

$a^4b^4 + a^3b^3 + a^2b^4 + ab^7$

$- a^3b^3 - a^2b^4 - ab^7 - b^8$

$- a^3b^3 - a^2b^4 - ab^7 - b^8$

$$a^3 - a^2b + ab^2 - b^3 = (a - b)\ (a^2 + b^2)$$

3. $2x^2 - x - 1$, $2x^2 + x - 3$

$= (2x + 1)\ (x - 1)$, $(2x + 3)\ (x - 1)$

$(2x + 1)$ and $(2x + 3)$ are prime to each other

$\therefore$ G.C.M. $= x - 1$ Ans.

$$\frac{5}{2x^2 + x - 3} - \frac{3}{2x^2 - x - 1}$$

$$= \frac{5(2x + 1) - 3(2x + 3)}{(2x + 1)\ (2x + 3)\ (x - 1)}$$

$$= \frac{4x - 4}{(2x + 1)\ (2x + 3)\ (x - 1)}$$

$$= \frac{4}{(2x + 1)\ (2x + 3)} \quad \text{Ans.}$$

4. An identical equation :

$(x + a)\ (x + b) = x^2 + (a + b)\ x + ab$

(1) $\frac{2x + \cdot0625}{2\cdot5} - \frac{x - \cdot125}{\cdot75} + \frac{7}{8} = 0$

Mult. by 3000

$2400x + 75 - 4000x + 500 + 2625 = 0$

$- 1600x = - 3200$

$x = 2$ Ans.

(2) $\frac{x - 5}{2} = \frac{(x - 2)^2}{2x - 5}$

$(2x - 5)\ (x - 5) = 2(x^2 - 4x + 4)$

$2x^2 - 15x + 25 = 2x^2 - 8x + 8$

$- 7x = - 17$

$x = 2\frac{3}{7}$. Ans.

Arithmetic.

(*Answer three questions only, including the last, if you can.*)

FEMALES ONLY.

1. How many articles can be bought for £102 4s. $1\frac{3}{4}$d. if 901 articles cost £100 8s. $5\frac{3}{4}$d. ?

2. Reduce £5 6s. 9d. to the decimal of £1000, and $12\frac{1}{4}$ lbs. to the decimal of $8\frac{3}{4}$ tons.

3. Divide £9 11s. 9d. into 3 parts, which shall be to each other in the ratio $3\frac{1}{3}$, $4\frac{1}{4}$, $5\frac{1}{5}$.

4. Multiply 35·04 by 75, and divide 4·5 by ·015 : work the latter sum by Vulgar Fractions so as to prove the rule for placing the decimal point in the quotient.

£ s. d.	£ s. d.	Art.	Art.
(1) 100 8 $5\frac{3}{4}$	: 102 4 $1\frac{3}{4}$	:: 901	: 917. Ans.

(2) £5 6s. 9d. to dec. of £1000.

12 9
20 6·75
1000 5·3375
·0053375. Ans.

$12\frac{1}{4}$ lbs. to dec. of $8\frac{3}{4}$ tons.

$12\frac{1}{4} = 49$ lbs. $= 7$ lbs.

$8\frac{3}{4}$ 35 tons 5 tons

$= \frac{1\cdot4}{2240}$ lbs.

$= \frac{1}{1600} = \cdot000625$. Ans.

(3) $3\frac{1}{3} + 4\frac{1}{4} + 5\frac{1}{5} = 12\frac{47}{60}$.

£ s. d.	£ s. d.
$12\frac{47}{60}$: $3\frac{1}{3}$ :: 9 11 9	: 2 10 0. Ans.
$12\frac{47}{60}$: $4\frac{1}{4}$ :: 9 11 9	: 3 3 9. Ans.
$12\frac{47}{60}$: $5\frac{1}{5}$ :: 9 11 9	: 3 18 0. Ans.

(4). 35·04
75
175 20
2452 8
2628·00 Ans.

·015)4·500(300. Ans.
4500
4·5 ÷ ·015
$= \frac{45}{10} \times \frac{1000}{15}$
= 300. Ans.

MALES ONLY.

1. If the wages of 311 men for 29 days be £413 7s. 5d., what should be the wages of 457 men for 10 days?

2. What principal will produce as simple interest £322 17s. 6d. in 7 years at $4\frac{1}{2}$ per cent. per annum ?

3. Divide the average of $3\frac{1}{3}$ of £5, $5\frac{1}{5}$ of £6, $1\frac{1}{4}$ of £29, by the average of 1·5, ·15, ·015.

4. Find the square root of 4624 and 63504. Show in the former case that the process is based upon the algebraic formula $(a + b)^2 = a^2 + 2ab + b^2$.

	£ s. d.	£ s. d.
(1) Men, 311 : 457	:: 413 7 5	: 209 9 2. Ans.
Days, 29 : 10		

(2) £100 produces $7 \times 4\frac{1}{2} = £31\frac{1}{2}$.

£	£ s. d.	£
$31\frac{1}{2}$:	322 17 6 :: 100	: 1025. Ans.

(3) $\frac{3\frac{1}{3} \text{ of } £5 + 5\frac{1}{5} \text{ of } £6 + 1\frac{1}{4} \text{ of } £29}{3} \div \frac{1\cdot5 + \cdot15 + \cdot015}{3}$

$= \frac{10}{3} \times 5 + \frac{31}{5} \times 6 + \frac{5}{4} \times 29 \div 1\cdot665$

$= \frac{50}{3} + \frac{186}{5} + 1\frac{5}{4} \div 1\cdot665$

$= 8\frac{6}{15} \div 1\cdot665$

$= 83\cdot25 \div 1\cdot665$

$= £50$. Ans.

(4) 4624(68. Ans.
36
128)1024
1024

63504(252. Ans.
4
45)235
225
502) 1004
1004

68 = 60 + 8

Let $a = 60$ $b = 8$

Then $(a^2 + b^2) = a^2 + 2ab + b^2$

That is $(60 + 8)^2 = 60^2 + 2(60 \times 8) + 8$

$= 3600 + 960 + 64$

$= 4624$

Mensuration.

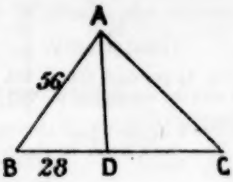
MALES ONLY.

(*Answer one question.*)

1. Find, in poles, the area of an equilateral triangle whose side is 56 yards.

2. A man, walking at the rate of $2\frac{1}{2}$ miles an hour, takes fifteen minutes to walk round a rectangular field, one side of which is two-thirds of the other side. Find the area of the field in acres.

1.



$$\sqrt{(56+28)(56-28)}$$
$$= 48\cdot497 \text{ AD.}$$
$$48\cdot497 \times 28 \div 30\tfrac{1}{2}$$
$$= \underline{44\cdot9} \text{ nearly.} \quad \text{Ans.}$$

2. $2\frac{1}{2}$ miles per hour

$= \frac{2\frac{1}{2}}{4} = \frac{5}{8}$ m. in 15 mins.

$\therefore$ two sides $= \frac{5}{16}$ m.

The proportion $= 2 : 3$

$\therefore$ the sides are $\frac{3}{16}$ m. and $\frac{5}{16}$ m. respectively,

or 220 yds. and 330 yds.

$220 \times 330 \div 4840 = \underline{15 \text{ acres.}}$ Ans.

Grammar.

(Answer three questions only.)

THE CLOUD.

1. I *bring* fresh showers for the *thirsting* flowers,
From the seas and the streams;
I bear light shade for the leaves *when laid*
In their noonday dreams:
From my wings *are shaken* the dews that *waken*
The sweet birds *every one*,
When *rocked* to rest on *their* mother's breast,
As she dances about the sun.
I am the *daughter* of the earth and water,
And the nursling of the sky;
I pass through the pores of the ocean and shores,
I change but I *cannot die*.

Paraphrase these lines, and point out what examples are to be found in them of figurative language.

2. Parse the words printed in italic.

3. Analyse the six lines from the *third* to the *eighth* inclusive.

4. Say which of the following words are of Latin, and which are of purely English origin, and give in each case another example of a word similarly formed:—Integrity, Brethren, Executrix, Wisdom, Wealth, Justice, Fortify, Happiness, Preceptor, Manhood.

(1) I am the bearer of refreshing rain from the seas and the streams to the flowers drooping from the heat of the sun. I throw a welcome shadow over the leaves unruffled by the breeze. The dews that revive the whole of the young birds in their nests, gently covered by their mothers' wings, are part of my substance. I am produced by the earth and the water, and brought up by the sky. I come through the smallest of places in the seas and the land. I am never long the same, but I never die.

Nearly the whole of the poem is figurative. The flowers are represented as thirsting like human beings; the leaves are called dreamers; the cloud is as a bird with wings, and a daughter born of parents and brought up by a nurse.

(2) *Bring*—verb, irreg., trans., act., ind., pres., 1st sing., agreeing with its nom. 'I.'
thirsting—participial adj. of quality, qualifying flowers.
when—advl. conj., joining the two sents. 'I bear, &c.' and 'They are laid, &c.'
laid—past part. of 'to lie,' referring to 'they' und. and forming with *are* und. the pres. ind. passive of 'to lie.'
are—aux. verb to 'shaken,' indicating pass. voice.
shaken—past part. of the verb 'to shake,' referring to 'dews.'
are shaken—verb, irreg., trans., passive, ind., pres., 3rd plur.. agreeing with its nom. 'dews.'
waken—verb, irreg., trans., act., ind., pres., 3rd plur., agreeing with its nom. 'that.'
every—distrib. adj. pro., 3rd sing.
one—numl. adj., qual. 'bird.'
every one—compound distrib. adj. pro., 3rd sing., obj. case, in appos. with 'birds.'
rocked—past part. of the verb 'to rock,' refg. to 'they' und. and forming with *are* und. the pres., ind., passive of 'to rock.'
their—pers. pro., com., plur., 3rd poss., govd. by 'mother's.'
daughter—com. noun, fem., sing., 3rd, nom. after 'am.'
can—aux. verb to 'die,' indicating pot. mood.
not—adv. of negation modifying 'can die.'
die—verb, reg., intrans., infin., gov. by 'can.'
can die—verb, reg., intrans., act., pot., pres., 1st sing., agreeing with its nom. 'I.'

Note.—If you have been taught to discard the potential mood, then parse 'can' fully as a principal verb, and do not parse 'can' and 'die' together.

(3) (*a*) Principal sentence.
Subj.—I
Pred.—bear
Obj.—light shade (dir.) for the leaves (ind.)
(*b*) Adverbial sentence to *a* (time)
Connective—When
Subj.—[they]
Pred.—[are] laid
Ind. Obj..—in their dreams (place).
(*c*) Principal sentence.
Subj.—The dews
Pred.—are shaken
Exten. of Pred.—from my wings (place).
(*d*) Adj. sentence to *dews* in *c*.
Subj.—That
Pred.—waken
Obj.—the sweet birds every one.
(*e*) Adverbial sentence to *d* (time).
Connective—When
Subj.—[they]
Pred.—[are] rocked
Obj.—to rest (indirect)
Exten. of Pred.—on their mother's breast (place).
(*f*) Adverbial sentence to *e* (time).
Connective—As
Subj.—she
Pred.—dances
Exten. of Pred.—about the sun (place).

(4)

Latin.	*Other Example*
Integrity	sincerity
Executrix	administratrix
Justice	malice
Fortify	magnify
Preceptor	acceptor
English	
Brethren	children
Wisdom	freedom
Wealth	health
Happiness (Icelandic)	clumsiness
Manhood	childhood

END OF FOURTH YEAR.

Euclid.

MALES ONLY.

[All generally understood abbreviations and symbols for *words* may be used, but not symbols of *operation*, such as −, +, ×.]

(Answer two questions, including question 3, if you can do so.)

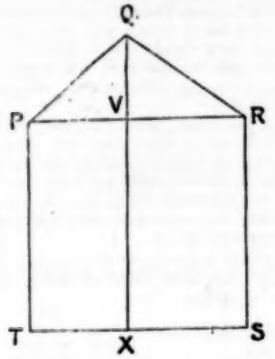
1. If a straight line be divided into any two parts, the squares on the whole line and on one of the parts, are equal to twice the rectangle contained by the whole and that part, together with the square on the other part.

Euclid, Book II., 7.

2. In every triangle, the square on the side subtending an acute angle is less than the squares on the sides containing that angle by twice the rectangle contained by either of those sides and the straight line intercepted between the perpendicular let fall upon it from the opposite angle, and the acute angle.

Euclid, Book II., 13.

3. PQR is an isosceles triangle right-angled at Q, and on PR is described the square RSTP. Join QS, and prove that the square on it is five times the square on one of the equal sides of the triangle.



Let PQR be given triangle.
On PR describe square PRST.
Join QS. Through Q draw QVX perpendicular to PR.
Then PV = VR (I. 26) and ∠ PQV = ∠ RQV.
∴ Each of them is half a right ∠ : and ∠ VRQ is half a right ∠, ∴ QV = VR (I. 6).
Square on QR = squares on QV, VR (I. 47).
∴ Square on QR is double square on VR, *i.e.*, on XS (I. 34).
Again square on QS = squares on QX, XS (I. 47).
And square on QX = nine times the square on VQ or VR.
For (II. 7) square on QX = squares on QV, VX, with twice XV, VQ.
But square on VX = four times square on VR for VX is double VR.
And twice the rectangles XV, VQ also = four times the square on V, R.
To these add square on VQ.
∴ Square on QX = nine times the square on VR or VQ.
To these add square on XS, *i.e.*, VR.
∴ Squares on QX, XS = ten times square on VR.
But squares on QX, XS = square on QS.
∴ Square on QS = ten times square on VR.
And square on QR is twice square on VR.
∴ Square on QS is five times square on QR.

Q. E. D.

Mensuration.

MALES ONLY.

(Answer one question only.)

1. The frame of a looking-glass is 5 ft. 4 in. long and 4 ft. wide (outside measure); find the dimensions of the glass when the area is equal to that of the frame.

2. Find (in acres) the area of a circular ring whose inner diameter is 9 chains 45 links, and outer diameter 12 chains 25 links. ($\pi = \frac{22}{7}$.)

(1) Area of glass and frame = $5\frac{1}{3} \times 4 = 21\frac{1}{3}$,
∴ Area of glass = $10\frac{2}{3}$ ft.
Let x = width of frame.
Then, $(5\frac{1}{3} - 2x)(4 - 2x) = 10\frac{2}{3}$.
$21\frac{1}{3} - 18\frac{2}{3}x + 4x^2 = 10\frac{2}{3}$
$x^2 - 4\frac{2}{3}x + 5\frac{1}{3} = 2\frac{2}{3}$
$x^2 - 4\frac{2}{3}x + (\frac{7}{6})^2 = -\frac{2}{3} + \frac{49}{36}$ or $\frac{25}{36}$
$x - \frac{7}{6} = \pm \frac{5}{6}$
$x = \frac{5}{6}$ ft. or 8 in.
∴ Length = 5 ft. − 1 ft. 4″ = 4 ft.
Breadth = 4 ft. − 1 ft. 4″ = 2 ft. 8 in.

(2) Outer radius = $\frac{1225}{2}$ = 612·5 links.
Inner ,, = $\frac{945}{2}$ = 472·5 ,,
Their sum = 1085. Their diff. = 140
1085 × 140 × $\frac{22}{7}$ = 477400 links
= 4·774 acres. Ans.

Arithmetic.

(Answer three questions only, including the last, if you can.)

FEMALES ONLY.

1. After deducting $2\frac{1}{2}$ per cent. from a bill, the sum paid was £2 2s. 3d.; what was the amount of the bill?

2. A man buys into a certain Stock at $100\frac{3}{4}$, and sells out at $100\frac{1}{2}$, and loses £96; how much of the Stock did he buy? [Neglect brokerage.]

3. Divide £730 9s. $3\frac{1}{2}$d. between A, B, C, so that C shall have three times as much as B, and B three times as much as A.

4. What is meant by saying that $\cdot\dot{7} = \frac{7}{9}$? Find the difference between $\cdot3\dot{7}$ of £4 10s. and $\cdot3\dot{7}$ of £4 19s.

(1) $97\frac{1}{2} : 100 :: \underset{£}{2}\ \underset{s.}{2}\ \underset{d.}{3} : \underline{\underset{£}{2}\ \underset{s.}{3}\ \underset{d.}{4}}$ Ans.

(2) Loss on $100\frac{3}{4} = 100\frac{3}{4} - 100\frac{1}{8} = \frac{5}{8}$.
$\therefore \frac{5}{8} : 96 :: \underset{£}{100\frac{3}{4}} : \underline{\underset{£}{15360}}$ worth. Ans.

(3) For every 1 share A has, B will have 3, and C 9. Total shares 13.

	£	s.	d.	£	s.	d.	
13 : 1 ::	730	9	$3\frac{1}{2}$	: 56	3	$9\frac{1}{2}$	A.
13 : 3 ::	730	9	$3\frac{1}{2}$	: 168	11	$4\frac{1}{2}$	B.
13 : 9 ::	730	9	$3\frac{1}{2}$	: 505	14	$1\frac{1}{2}$	C.

(4) $\frac{1}{3} = \cdot\dot{1}$ ∴ $\frac{\cdot3\dot{7}}{\cdot\dot{1}} = \cdot\dot{7}$
$\cdot3\dot{7}$ of £4 19s. − $\cdot3\dot{7}$ of £4 10s.
$= \frac{37}{99} \times \frac{99}{1} - \frac{37-3}{90} \times \frac{90}{1}$
$= 37s. - 34s.$
$=$ 3 shillings. Ans.

MALES ONLY.

(Answer three questions only, including the last if you can.)

1. How many cubic feet of lead, $\frac{3}{16}$ of an inch thick, will be required to cover the steps of a staircase composed of 50 steps, each step being 2 feet long and 8 inches wide?

2. Of 5,000,000 scholars liable to attend school, if 25 per cent. are absent on Monday morning, 15 per cent. on Monday afternoon, Tuesday morning and afternoon, and Wednesday morning, 20 per cent. on Wednesday afternoon, Thursday morning and afternoon, and 30 per cent. on Friday morning and afternoon, what is the average number present for each of the ten attendances?

3. What principal will amount to £578 16s. 3d. in 3 years, at 5 per cent. per annum compound interest?

4. Find the cube root of 10,648 and of 188,132,517, and show in the former case that the process for extraction of a cube root is based upon the Algebraic formula

$$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3.$$

(1) $50 \times 2 \times \frac{3}{5} \times \frac{2}{15 \times 12} = \underline{\frac{30}{9}}$ cub. ft. Ans.

(2) (25 + 15 + 15 + 15 + 15 + 20 + 20 + 20 + 30 + 30) ÷ 10
= $20\frac{1}{2}$ average % of absentees
$20\frac{1}{2}$ % of 5,000,000 = 1,025,000
∴ 5,000,000 − 1,025,000 = 3,975,000. Ans.

(3)

	£		
	1		1st year's principal
5 % =	·05	,,	,, interest
	1·05	2nd	,, principal
5 % =	·0525	,,	,, interest
	1·1025	3rd	,, principal
5 % =	·055125	,,	,, interest
	1·157625	Amount of £1 in 3 years	

$\underset{£}{1{\cdot}157625} : \underset{£}{578{\cdot}8125} :: \underset{£}{1} : \underline{\underset{£}{500}}$. Ans.

(4) $10648(22$. Ans.

$2^3 = 8$

$2^2 \times 300 = 1200$ | 2648

$2 \times 30 \times 2 = 120$

$2^2 = 4$

1324 | 2648

$188,132,517(573$. Ans.

$5^3 = 125$

$5^2 \times 300 = 7500$ | 63132

$5 \times 30 \times 7 = 1050$

$7^2 = 49$

8599 | 60193

2939517

$57^2 \times 300 = 974700$

$57 \times 30 \times 3 = 5130$

$3^2 = 9$

979839 | 2939517

$(a + b)^3 = a^3 + 3a^2b + 3a^2b^2 + b^2$

Let a = tens. b = units

Then $20^3 = 8000$. $10648 - 8000 = 2648$.

Now 2648 should contain $3.20.2^2 + 3.20.2^2 + 2^2$

The method gives $\begin{pmatrix} 3.20.20 \\ + 3.20.2 \\ + 2.2 \end{pmatrix} 2 = 1324.2 = 2648.$

Grammar.

BOYS AND GIRLS.

(*Answer questions* 1 *and* 4 *and one other question.*)

1. But '*tis* a common *proof*
That lowliness is young ambition's ladder,
Whereto the climber upwards turns his face,
But when he *once* attains the upmost round,
He then unto the ladder turns his back,
Looks in the clouds, *scorning* the base degrees
By which he did ascend. So Cæsar may:
Then *lest he may*, prevent. [And since the quarrel
Will bear no colour for the thing he is,
Fashion it thus; that what he is, augmented
Would run to these and these extremities:]
And therefore think him as a serpent's egg,
Which *hatched* would, as his kind, *grow mischievous*,
And kill him in the shell.

Express in your own words the substance of the first eight lines of this passage, down to the word 'prevent.'

2. Select from the passage any words which you know to be of Latin origin, and give their meanings and derivations.

3. Analyse the passage enclosed within brackets.

4. Parse the words printed in italic.

5. Who were the chief English writers living in the time of Queen Elizabeth? Give a brief account of any one book of the Elizabethan period, of which you know most.

(1) Everyone is aware that the person who is eager for power uses the mask of humility as a means of attaining his end, ever practising that virtue till he has reached the goal he aimed at. When once he has succeeded he discards the character he had assumed, and takes no more notice of the things which he has used to aid him in his ascent. It is quite possible that Cæsar may adopt such a method, and lest he should do so, let us hinder him in his attempt.

(2) LATIN WORDS. MEANINGS AND DERIVATIONS.
Proof—test, result obtained by trying; from *probo*.
ambition—desire for power, &c., the going about seeking for power; from *ambio, ambi*, about, and *eo, itum*, to go.
attains—touches; reaches; secures; from *ad*, to, and *tango*, to touch.
basis—a step, a foundation; from *bainio*, to step.
degrees—steps; from *de*, down, and *gradus*, a step.
ascend—to climb; from *a*, to, and *scando*, to climb.
prevent—to go before so as to hinder; from *pre*, before, and *venio*, to come.
quarrel—complaint, dispute, brawl; from *queror*, to complain.
fashion—the form, appearance, or cut of a thing; from *facio*, to make.
colour—hue, appearance; from *color*.
augmented—increased; from *augeo*, to increase.
extremities—utmost limits; from *exter*, outward; superlative, *extremus*.
serpent—a creeping animal; from *serpeo*, to creep.
mischievous—evil; from *mis*, ill, and *caput*, the head.

(3) (*a*) Principal sentence.
Subj.—[You.]
Pred.—fashion.
Obj.—it.
Ext of Pred—thus (manner).
(*b*) Adverbial sentence (reason) to *a*.
Connec.—since.
Subj.—the quarrel.
Pred.—will bear.
Obj.—no colour (dir.) for the thing (ind.).
(*c*) Adjective sentence to *thing* in *b*
Subj.—he.
Pred.—is [which].
(*d*) Noun sentence in app. with *it* (*c*).
Connect.—that
Subj.—[that thing] (included in *what*) augmented
Pred.—would run
Obj.—to these and these extremities (ind.)
(*e*) Adjective sent. to *thing* in *d*.
Subj.—he.
Pred.—is [which].

(4) '*tis* = it is.
it—pers. pro., neut., sing., 3rd. homin. to 'is.'
is—verb, irreg., intr., act., ind., pres., 3rd, sing., agreeing with its nom. 'it.'
proof—abst. noun, neut., sing., nom. after 'is.'
that—cop. conj., joining the two sentences 'It is a proof' and 'Lowliness is, &c.'
whereto—advl. conj., joining the sentences 'Lowliness is, &c.,' and 'The climber turns, &c.'
scorning—pres. part. of the verb 'to scorn,' referring to 'he.'
lest—advl. conj. joining the two sentences 'You prevent' and 'he may scorn.'
he—pers. pro., masc., 3rd, sing., nom. to 'may scorn.'
may—aux. verb to 'scorn,' indicating pot. mood, used for the subjunctive.
hatched—past part. of 'to hatch,' referring to 'egg.'
grow—verb, irreg., intrans., act. inf., pres., gov. by 'would.'
mischievous—adj. of quality, qualifying 'serpent.'

(5) William Shakespere, Lord Bacon, Sir Walter Raleigh, Edmund Spencer, Sir Philip Sidney, Ben Jonson, Christopher Marlowe, Richard Hooker, Roger Ascham, William Camden.

Perhaps the book I know best among those written by the above writers is 'Shakespere's Works.' He wrote thirty-seven plays, which may be divided into tragedies, comedies, and historical plays. Of these the greatest tragedies are, perhaps, *Hamlet, King Lear*, and *Macbeth*; the best historical plays are *Richard III.* and *Julius Cæsar*; and the finest comedies are *Midsummer Night's Dream* and *As you like it*. Those which are most commonly acted in the present day are *Hamlet, Richard III., Merchant of Venice*, and *As you like it*. Besides plays he wrote many poems, the chief of which are *Venus and Adonis, Tarquin and Lucrece*, and upwards of one hundred and fifty sonnets. In his works Shakespere displays a great amount of knowledge of men and things; he uses a very large vocabulary; has an infinite power of expression; and displays the utmost skill in depicting the minds and characters of those whom he makes the chief actors in his plays. His works are for all men and for all time.

Algebra.

MALES ONLY.

(*Answer three questions, including questions* 1 *and* 4, *if you can.*)

1. Show that the product of two expressions is equal to the product of their greatest common measure and least common multiple.

Find the G.C.M. of

$6a^4b - 17a^3b^2 + 14a^2b^3 - 3ab^4$, and $2a^4 + 3a^3b - 9a^2b^2$.

2. Prove that $(a^m)^n = a^{mn}$, where m and n are positive integers.

Find the square root of $4a^4 - 12a^3 + 29a^2 - 30a + 25$.

3. Express $5a^2b^2c^2$ as a fraction whose denominator is $5a^3b^3c$; and simplify—

$$\left(\frac{3a-2x}{3a^2-2x^2}-\frac{2a-3x}{2a^2-3x^2}\right)\div\frac{5ax\,(a-x)}{3a^2-2x^2}.$$

4. Solve the equations:—

(1) $\begin{cases} 13x-11y=49. \\ 13y-11x=25. \end{cases}$

(2) $3x^2-51x+216=0.$

(1) The G.C.M. is the greatest factor common to both expressions.

The L.C.M. is the product of the numbers after the common factors have been taken away.

∴ the product of the two numbers is the product of their G.C.M. and L.C.M. Example:

$a-b$, a^4-b^4

are two expressions. Their G.C.M. is $a-b$. Their L.C.M. is a^4-b^4. ∴ product of two expressions = L.C.M. × G.C.M.

$6a^4b-17a^3b^2+14a^2b^3-3ab^4$, and $2a^4+3a^3b-9a^2b^2$.

From the first take away the factor b, not common to both, leaving $6a^4-17a^3b+14a^2b^2-3ab^3$ and $2a^4+3a^3b-9a^2b^2$.

Resolved into factors these are $(2a^2-3ab)\,(3a^2-4ab-b^2)$ and $(2a^2-3ab)\,(a^2+3ab)$.

Then G.C.M. $=\underline{2a^2-3ab}$. Ans.

(2) $(a^n)^n = a^n \times a^n$ ..... to the n^{th} power
$= a^n$ taken n times
$= a^{nn}$.

(3) $4a^4-12a^3+29a^2-30a+25(2a^2-3a\times 5$

$4a^4$

$4a^2-3a)\ -12a^3+29a^2$

$-12a^3+9a^2$

$4a^2-6a+5)\ 20a^2-30a+25$

$20a^2-30a+25$

$5a^2b^2c^2\times\frac{5a^2b^2c}{5a^2b^2c}=\frac{25a^4b^4c^4}{\underline{5a^2b^2c}}$. Ans.

$$\left(\frac{3a-2x}{3a^2-2x^2}-\frac{2a-3x}{2a^2-3x^2}\right)\div\frac{5ax\,(a-x)}{3a^2-2x^2}$$

$$=\frac{(2a^2-3x^2)\,(3a-2x)-(3a^2-2x^2)\,(2a-3x)}{(3a^2-2x^2)\,(2a^2-3x^2)}\times\frac{3a^2-2x^2}{5ax(a-x)}$$

$$=\frac{-5ax^2+5a^2x}{(3a^2-2x^2)\,(2a^2-3x^2)}\times\frac{3a^2-2x^2}{5ax\,(a-x)}$$

$$=\underline{\frac{1}{2a^2-3x^2}}\text{ Ans.}$$

(4) (1) $13x-11y=49$
$13y-11x=25$
Adding $2x+2y=74$ or $x+y=37$
Subtracting $24x-24y=24$ or $x-y=1$
Adding $2x=38$
$x=\underline{19}$. Ans.
$19-y=1$
$y=\underline{18}$. Ans.

(2) $3x^2-51x+216=0$
$x^2-17x=-72$
$x^2-17x+(8\frac{1}{2})^2=-72+72\frac{1}{4}$ or $\frac{1}{4}$
$x-8\frac{1}{2}=\pm\frac{1}{2}$
$x=\pm\frac{1}{2}+8\frac{1}{2}$
$x=\underline{9}$ or $\underline{8}$. Ans.

END OF FIRST YEAR.

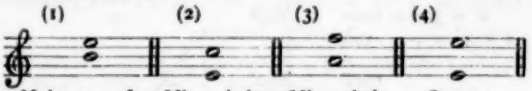
Music.

STAFF NOTATION.

1. Write the following an octave lower on the Bass clef, doubling the value of every note:—

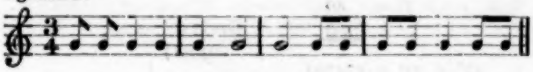
2. Write below each of the following intervals its name (major second, &c.):—

(1) (2) (3) (4)



Major or perfect fourth. Minor sixth. Minor sixth. Octave.

3. Add bars to the following in accordance with the time-signature:—



TONIC SOL-FA NOTATION.

1. State what measures are shown by the following pulse-signs:—

(1) | : : | : : ‖

(2) : | : | : | ‖

(1) Three-pulse. (2) Four-pulse secondary.

2. Write the names of the following intervals:—

(1) *soh* to *doh*^{1}. Major or perfect fourth.
(2) *me* to *doh*^{1}. Minor sixth.
(3) *te* to *fah*^{1}. Minor or diminished fifth.
(4) *me* to *me*^{1}. Octave.

3. Write the following an octave lower, halving the value of each note:—

| s :— | d^1 :— | t :— |— :— | m^1 :— | d^1 :— ‖

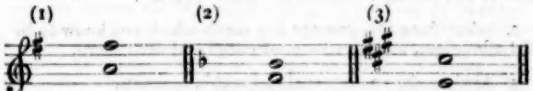
| s$_1$:d | t$_1$:— | m :d ‖

END OF SECOND YEAR.

STAFF NOTATION.

1. Write below each of the following intervals its name (major third, &c.):—

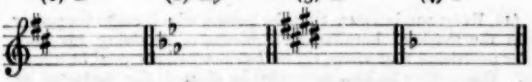
(1) (2) (3)



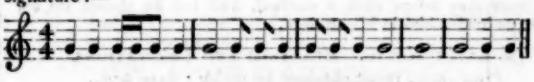
Major sixth. Major or perfect fourth. Major sixth.

2. Write the signatures of the following major keys (treble clef):—

(1) D (2) E♭ (3) E (4) F



3. Add bars to the following in accordance with the time-signature:—



TONIC SOL-FA NOTATION.

1. What are the mental effects of (1) *fah*, (2) *ray*, (3) *lah*?

(1) Grave, expectant. (2) Prayerful, expectant. (3) Sad, mournful.

2. Write the names of the following intervals:—

(1) *fah* to *ray*^{1}. Major sixth.
(2) *soh* to *fah*^{1}. Minor seventh.
(3) *doh* to *te*. Major seventh.
(4) *me* to *ray*^{1}. Minor seventh.

3. State what measures are shown by the following pulse-signs :—

(1) | : : | : : ‖

(2) : | | : | : | : ‖

(3) | : : | : : | : : ‖

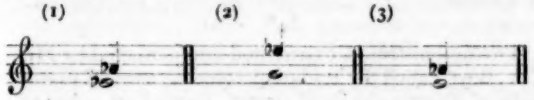
(1) Six-pulse. (2) Four-pulse. (3) Nine-pulse.

END OF THIRD YEAR.

STAFF NOTATION.

1. Write above (1) a perfect or major fourth, above (2) a minor sixth, above (3) a minor third.

(1) (2) (3)



2. Complete each of the following bars by adding one note at the end :—

3. State (briefly) the meanings of the following terms :—

(1) Legato.	In a bound, connected manner.
(2) Dal Segno.	Return to the sign.
(3) Allegro.	Quickly.
(4) Ritard.	Slacken the pace.

TONIC SOL-FA NOTATION.

1. Write a major sixth above each of the following notes :— (1) Above *fah—ray*^{1}. (2) Above *lah—fe*^{1}. (3) *te*^{1}—*se*.

2. Write (in figures) over each note and rest in the following passage its value in pulses or fractions of a pulse :—

1 ½ ½ ½ ½ 1 ¾ ¼ 1 1 1 2

| s :- .l | s .d^1 : t | d^1 .,s : f | m : | d :- ‖

3. State (briefly) the meanings of the following terms :—

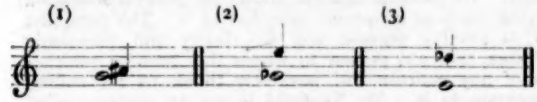
(1) Legato.	In a bound, connected manner.
(2) Dal Segno.	Return to the sign.
(3) Allegro.	Quickly.
(4) Ritard.	Slacken the pace.

END OF FOURTH YEAR.

STAFF NOTATION.

1. Write above (1) an augmented second, above (2) an augmented sixth, and above (3) a diminished seventh :—

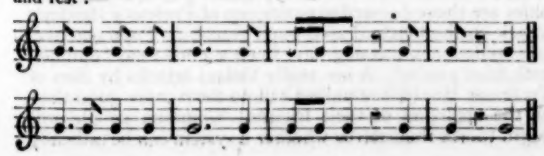
(1) (2) (3)



2. What minor keys are shown by the following signatures ?

(1) G minor. (2) F minor. (3) B minor. (4) C♯ minor.

3. Re-write the following, doubling the value of every note and rest :—



TONIC SOL-FA NOTATION.

1. Write an augmented fifth above each of the following :— (1) *doh—se*. (2) *fah—de*^{1}. (3) *soh—re*^{1}.

2. In the minor mode (1) what is the minor or essential sixth, and (2) the minor or occasional seventh ? (1) *fah*. (2) *soh*.

3. Re-write the following, doubling the value of each note and rest :—

| s .m : f .,l | r .m,f : s ‖

| s :m | f :-.l | r :m.f | s :- ‖

Science Notes.

ONE of the most remarkable experiments hitherto performed has been the transplanting of a portion of a nerve from a living rabbit to a human subject. The illustrious and learned doctor upon whom the operation was performed is doing well.

***

Dr. GUPPY and others are impressed with the possibility of the diffusion of the seeds of plants by birds. It is recommended that the crops of birds shot at sea in high latitudes should be examined, with a view of finding whether seeds are actually conveyed by that means in any great numbers. This may not explain all the difficulties that at present beset the question of the distribution of plants in the southern hemisphere, but at the same time it is confidently believed in some quarters that it may throw a good deal of light upon an intricate question.

***

We learn from *Nature* that at the last conversazione of the Royal Society there was an unusually splendid display of experiments and demonstrations. Among the most striking and interesting were the experiments with soap bubbles shown by Mr. C. V. Boys, who also exhibited his Radio-micrometer, an instrument much more delicate than the thermopyle. The experiments with the soap bubbles were designed to show the power of an air film to prevent two air bubbles from coming into real contact. The outer of two bubbles may be pulled out until it squeezes the inner one into a long oval, but no real contact takes place. An inner bubble filled with gas will carry up an outer one, to which are attached a wire and other things, without really touching it at all. A bubble will roll down a spiral groove also made of soap film, or jump one or two steps at a time down a spiral staircase made of soap film, without touching the spiral film or being injured in the least.

Sections and specimens illustrating the recent borings in the delta of the Nile were exhibited by Professor Judd, F.R.S. The whole of the samples obtained from these borings have now reached the Royal Society, and the examination reveals some facts of great geological interest. The alternations and mixtures of blown sand and Nile alluvium were found to continue down to the depth of 121 feet below the surface, or about 95 feet below the level of the Mediterranean. At that depth a remarkable change in the deposits took place, and beds of gravel containing both pebbles and sub-angular fragments of

quartzite and compact limestone and some metamorphic and igneous rocks were found, and similar bed occur at intervals down to the greatest depth reached. Up to the present time no contemporaneous organic remains have been found in these deposits.

***

A MOST instructive paper on Head growth in students at the University of Cambridge has been recently read. The measurements have been taken during the last three years. The maximum length and breadth of the brain have been measured, and its height above a specified plane. The product of these three quantities has been taken to represent the brain volume of the student.

The products thus obtained are classified as referring (A) to high class honour men; (B) the remaining honour men; and (C) the 'poll' men.

Ages.	Class A.	Class B.	Class C.
19	241·9	237·1	229·1
20	244·2	237·9	235·1
21	241·0	236·4	240·2
22	248·1	241·7	240·0
23	244·6	239·9	235·0
24	245·8	251·2	244·4
25 & upwards	249·9	239·1	243·5

Dr. Venn draws four conclusions from his figures.

I. Although it is pretty well ascertained that in the masses of the population the brain ceases to grow after the age of 19, or even earlier, it is by no means so with University students.

II. That men that have obtained high honours have had considerably larger brains than others at the age of 19.

III. That they have larger brains than others, but not to the same extent, at the age of 25. In fact their predominance is by that time diminished to one-half of what it was.

IV. Consequently high honour men are presumably as a class both more precocious and more gifted throughout than others. We must therefore look upon eminent University success as a fortunate combination of these two helpful conditions.

***

THE London Geological Field Class, under the direction of Professor H. G. Seeley began the summer excursions on Whit Monday, May 21st, and will continue them on Saturday afternoons thereafter up to July 14. The following are among the places which will be visited: Leatherhead and Boxhill, to examine the gore of the Mole in Chalk; Maidstone and the vicinity for gravels; Woolwich and Reading for beds of chalk, gault, and lower greensand; Erith and Crayford for river gravels; Northfleet and Oxted for studies in chalk. Intending students should apply at once for tickets as only a limited number will be issued. Applications should be made to W. P. Collins, 157, Great Portland-street.

***

FOR those who are interested in African travels, a most interesting work has recently appeared in one volume, by Professor Drummond. It is certain to be very much read and widely circulated.

IN a paper recently read before the Institution of Civil Engineers, Mr. Ellington read a paper on hydraulic power in London, with special reference to the use of lifts. He strongly advocated the use of a simple ram as the safest mode of construction. Suspended lifts depend on the condition of the ropes or chains by which they hang, and are therefore all to a certain extent dangerous.

***

A NEW and apparently very valuable process of extracting the alkaloids from Cinchona bark, by means of oil, has been perfected by Dr. King, the superintendent of the Sikkim plantation. This will in all probability lead to a permanent reduction in the price of quinine.

***

THE new instrument currented and perfected by Mr. C. V. Boys, called the Radio-micrometer, consists essentially of thermo-electrical circuit, formed of a bar of antimony and bismuth, of small sectional area, the ends being formed by a loop of copper wire, and suspended in a strong magnetic field by an exceedingly finely drawn torsion fibre.

Publications Reviewed.

Technical Education. A Two-fold Protest, Educational and Financial. By J. H. Newbold, B.A. Heywood and Co.

Mr. Newbold needs no introduction to many of the readers of this Journal. His paper, read before the Conference on Education under healthy conditions, held in Manchester in 1885, was afterwards reprinted and circulated all over the country. We remember how the idea of over-pressure was scouted by the officials, from the Vice-President downwards. Some of us, too, remember how carefully they then set themselves to work to reduce it.

Mr. Newbold has now, in a pamphlet of 60 pages, discussed the whole question of technical education. Any contribution to the study of this important subject, from a person competent to deal with it, is most opportune, and no one who reads the pamphlet will doubt the author's ability to write upon it. Mr. Newbold makes a protest, as he says, both upon educational and financial grounds, against stereotyping education by making it conform to a general syllabus, and putting the charge of it upon the rates. He protests against sacrificing general education to the teaching of special branches of it. The pamphlet is so forcibly argued, and so clearly and pleasantly written, that any person to whom this burning question is of any concern will positively thank us for calling attention to it. Mr. Newbold is not an obstructionist. Those who are deeply impressed with the conviction that something must be done to train the hand and cultivate the eye of our elder scholars will not see much to disagree with; while those who are of opinion that any general system of handicraft or manual training must lie altogether outside the present school, and be practically independent of it, will find much to stimulate and encourage them. Not the least piquant pages of the pamphlet are those devoted to a criticism of Professor Huxley's attack on the much-abused pupil teacher. Pupil teachers and students in training have been a good deal 'damned with faint praise.' A few really violent attacks by men of Professor Huxley's standing will do them more good than all the apologies of their friends. Common people will begin to ask themselves whether a system can be radically

wrong which has produced a set of men who have done exceedingly well what was demanded of them, and who have not lost thereby their capacity of doing something very different and, in their own opinion, very much better. Professor Huxley must have forgotten that Dr. Fitch and Professor Judd were once students in training; and he will hardly maintain that they are the only two that deserve honourable mention.

It is a good sign when nonsense provokes a smile, by whomsoever it is spoken. The Professor's sense of humour must have forsaken him on the occasion of his visit to Manchester. A boy of fourteen passes in fourteen science subjects at South Kensington, and is rewarded with a National Scholarship. The Dean of the Science School rails at the Whitehall department for 'pouring in' and giving no time to think. This is too much.

But while Mr. Newbold's criticism is fearless, it is essentially good natured. He never loses his temper or his self-control. There is no phase of the education question for the last quarter of a century which Mr. Newbold has not studied, and studied carefully. He writes with a full knowledge of his subject, and we are sure that those who read his pamphlet will feel greatly indebted to him for the clearness and ability with which he has stated his case.

Arithmetic for Beginners: A School Book of Commercial Arithmetic. By the Rev. J. B. Lock, M.A. Macmillan and Co.

Mr. Lock's reputation as an author was made by his text book upon Trigonometry, and it has been increased by his later work on Dynamics. He has now issued a school class book written mainly with a view to meet the requirements of the new examination for commercial certificates. Hence, more prominence is given to exchange and foreign money, and less to recurring decimals. But while, perhaps, specially intended for a specific purpose, the book will be found useful in almost all schools, as it contains enough of theory and abundance of practice. Readers of Mr. Lock's other books will not be surprised at the singular precision and clearness of the statements. The author has three marked qualifications for his work; he is thoroughly master of his subject, he is a successful and experienced teacher, and he has the faculty of literary expression. Few writers of mathematical books combine these qualifications in an equal degree. The printing of the book is most admirable.

We have said there is a chapter on foreign money. Would it not be well to devote two more pages to the decimal system so far as it relates to weight, length, and capacity. It is exceedingly useful, and is becoming more and more so. As a teacher of physics Mr. Lock must be perfectly aware of this. The treatment of the subject on page 77 is too meagre. It must be clearly understood that Arithmetic cannot be exhaustively treated in a book of 170 pages. The teacher will have to add to the illustrations and proofs. As a concise collection of principles, rules, and examples, it is excellent. We have no doubt it will be very largely used. It is an honest and trustworthy book to put into a boy's hands.

Elementary Physiography. By John Thornton, M.A. Longmans, Green and Co. London.

This science subject shows signs of increasing popularity. This is evident, whether we consider the number of students who annually attempt the examination or the number of text books appearing year by year to meet the wants of these pupils. The Manual before us is the most complete of its kind issued. Hitherto students have required to read from several works and frequently considerable difficulty has been experienced in knowing how much of each work to select. This has not been always an evil, for it has made careful teaching and guidance necessary. Mr. Thornton has collected largely from standard works on the many sciences making up the subject of Physiography. The selection of material has been made from the newest and most reliable authorities and the additional matter supplied by the author will be especially valuable for its general accuracy, its logical arrangement and the admirable manner in which it is illustrated. In reading carefully through the work the following corrections are necessary.

1. The Foraminifera would appear to be so named (page 52) because of the numerous holes in each chamber through which the thread-like portions of the animal's body protrude. Now it is the passage which connects the various chambers for which the named is applied.

2. Trachyte is with difficulty settled in its position amongst the igneous rocks. On page 70 the old and oft repeated description is given and this is followed by the statement that *Obsidian* is a variety of Trachyte. Again on page 72 Trachyte is stated to be the volcanic form of Granite. The professor who examines the pupils in Physiography will require them to know that Trachyte is the lava form of syenite and that Rhyolite is the lava form of granite; whilst Obsidian is the glassy form of all lavas except basalt.

3. The origin of Boulder clay is stated on page 174 to be due to glaciers with no reference to ice-cap or ice-sheet conditions.

4. On page 231 we find the following 'In ordinary language the word "day" or civil day means what the astronomer calls a *mean solar day*. This has been described as the average of the *true solar day*, which is the time between two successive meridian passages of the sun.' The author here confounds the civil day (from midnight to midnight) with the astronomical day (from mid-day to mid-day).

5. On page 234, the author states that 'the earth's axis is *perpendicular to the line* joining the centre of the earth and sun.' This fact is made to account for the equality of day and night at the equinoxes. Now it is true, that at the equinoxes, the axis of the earth is in a plane at right angles to the plane of the earth's orbit; a simple model however, would be sufficient to show the class that the axis of the earth is never at right angles to the line joining the centres of the sun and earth.

The work has been got up in excellent style: Drawings from official and other sources have been abundantly introduced; the original sketch on page 113 is poor. The maps are good.

Tildesley's Higher Examination Series. Complete Guide to the London Matriculation Examination. Civil Service Press.

The work contains 60 pages of letterpress, which consist of the regulations of the examination, the requisite text books, hints and instructions, papers set at the examination, and solution of the mathematical questions.

We have looked through the list of text books. Such a list is of course to a certain extent a matter of taste, but it certainly contains some very trustworthy class-books. We were disappointed with the hints. A 'complete guide' which, under the head of hints and instructions, gives less than six lines to French, can hardly be considered satisfactory. We cannot see much to help a student in these instructions, nor do we consider that the book at all corresponds to its title.

Every Man his own Art Critic at the Manchester Exhibition. By Patrick Geddes. London and Manchester; John Heywood.

Although this little pamphlet might from its title be supposed to be of purely local and ephemeral interest, there is much in its contents deserving of more extended and lasting application. The author has taken the really magnificent display of pictures at the Manchester Exhibition last year as a peg on which to hang a sketch of the principles which in his opinion should guide us in appraising the qualifications – good, bad, or indifferent – of pictorial works of art. Although we are of course unable now by actual inspection to verify the correctness of the strictures or praises passed on many of the pictures

then exhibited, we remember some of the works referred to sufficiently well to be able to endorse some of the opinions advanced. We may be perhaps too Philistine to be able quite to sympathise with the author in his enthusiastic examination of the gradations of colour, the delicacy of treatment and the balance of form, on which he at times dilates, but at any rate we appreciate his efforts to explain to the general public the elementary canons of art criticism sufficiently well to be able to say that his little pamphlet contains much that is interesting to the casual visitor to any picture gallery and much that is likely to be of use to those who are now and then called upon to act professionally as art critics.

Test Exercises in Algebra. London and Edinburgh: W. and R. Chambers.

Messrs. Chambers have published the Test Exercises just added to their Standard Algebra in a separate pamphlet under the above name. The tests are sixty-four in number, embracing four, five, or six examples in each, which cover the work of the schedule as far as quadratic equations. The tests are chiefly mechanical, and are reasonably difficult for the pupils for whom they are intended.

Geography of the British Isles. By Archibald Geikie, LL.D. London: Macmillan and Co.

This is an excellent little summary of the geography of our islands. The islands are first treated of as a whole, and their size, surface, climate, productions, and other interesting features, described. Then each country is treated in greater detail, a short description of each county and its chief towns being added to the physical features. The style is clear and interesting, and the details are full without being unnaturally burdensome. The figures for areas and population are enclosed in brackets, and can thus be learned or otherwise at the discretion of the teacher.

Dress Cutting Out. By Mrs. Henry Grenfell and Miss Baker. London: Longmans and Co.

Under this title Messrs. Longman have issued in a stout envelope three sheets of squared paper on which are drawn to measurement the patterns of the various parts of the body of a dress.

Full directions are given for taking the measurements necessary for any dress, and after these are taken accurately any female with ordinary intelligence should be able to draw the necessary pattern and cut out for herself a dress which should be a perfect fit. The directions are clear, precise, and unmistakeable, while the drawing is careful and accurate. The Recreative Evening Schools' Association have done well in publishing for their pupils these aids to scientific dress cutting.

Practical Papers in Civil Service Geography. By George E. Skerry, F.R.S.L. London: Simpkin, Marshall and Co. &c.

A number of examination papers in geography set for various branches of the Civil Service, together with practical directions for working an examination paper, methods of study, and specimen answers, make up a pamphlet of 77 pages under the above title. As the questions already given seem to traverse the whole of the physical and political geography of the world in more or less detail, a very simple direction would seem to suffice for all candidates. Such advice would be:—Know thoroughly the whole of the geography of the world and be able to draw any map, and you will be sure to obtain good marks at the Examination. We commend the volume only as we commend others compiled with the same end in view. It gives specimens of the questions set, which will serve for practice to intending candidates. The hints may be of service, but neither hints nor questions will make up for thorough hard study before the examination commences.

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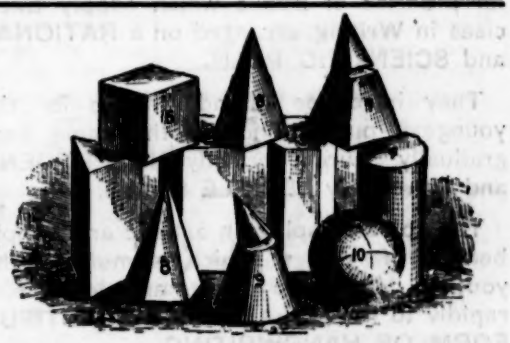

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